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GENERAL

6248 Atomic and Solar Energy. Farrington Daniels. Am. Scientist 38, 520-48(1950) Oct.

From a general discussion of atomic energy, nuclear reactors, atomic warfare, solar energy, photochemical utilization of solar energy, maximum agricultural crop yields, etc., it is concluded that in the foreseeable future atomic power will be utilized in large central stations involving heavy capital investments, and that solar power may well be employed in simpler decentralized units involving less expense.

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6249 The Absorption of Fatty Esters in the Mouse Intestine. James F. Mead, Leslie R. Bennett, Arthur B. Decker, and Melvin D. Schoenberg. UCLA-88, Aug. 30, 1950. 11p.

The methyl esters of the higher fatty acids are not emulsified to any extent in the intestine of the fasted animal. Small amounts of corn oil or monopalmitin promote emulsification. Absorption of methyl esters is subnormal in the fasted animal and is brought to normality by one of the above-mentioned substances. Several results from the literature are reinterpreted on this basis. (auth)

6250 The Spectrophotometric Examination and Acute Toxicity of Rutins Obtained from Fagopyrum esculentum (Buckwheat) and Sophora japonica. J. W. E. Harrisson, Bella W. Seltzer, and Eric W. Martin. J. Am. Pharm. Assoc. Sci. Ed. 39, 556-9(1950) Oct.

Comparative ultraviolet absorption spectra are presented for rutins obtained from Fagopyrum esculentum (buckwheat) and Sophora japonica. An investigation has been made of the comparative acute toxicities of the rutins obtained from the above two sources, the LD_{50} for each being about 950 mg/kg of mouse by the intravenous route when in a propylene glycol solution and about 4000 mg/kg when in suspension. These toxicity data are comparative only and do not necessarily reflect any suspicion of toxicity under conditions of therapeutic use. The two rutins are identical with respect to both their ultraviolet absorption spectra and their relative toxicities. (auth)

6251 Advances in Radiobiology between 1937 and 1950. Antoine Lacassagne. Nucleonics 7, No. 4, 62-7 (1950) Oct.

In this survey, the author foregoes comment on individual experiments in radiobiological research to note the development of a fertile tendency to seek a biochemical explanation for cytological radiolesions. (auth)

6252 Changes Produced by X-rays in Blood Corpuscles. Part 3. E. A. Zimmer. Strahlentherapie 82, 129-42(1950) May 15 (in German).

This is a continuation (Part 3) of a paper on changes produced by x-rays in blood counts. A discussion of the results and a summary of the entire work are published as Part 4 (Strahlentherapie 82, 261-80(1950)).

6253 Changes Produced by X-rays in Blood Corpuscles. Part 4. E. A. Zimmer. Strahlentherapie 82, 261-80 (1950) June 12 (in German).

Results are discussed of an experimental investigation of typical changes produced in the numbers of blood corpuscles by x-irradiations of various organs. Small doses on the bone marrow reduce the number of erythrocytes, while large doses increase it (consequently, the known failures in the radiotherapy of polycythemia are due to excessive doses); small doses on the spleen increase the erythrocyte count. The number of thrombocytes increases when bone marrow is irradiated with 400 r; it decreases when the spleen is treated with small doses. The leucocyte count decreases after a small-dose irradiation of the liver, or after a large-dose irradiation of the bone marrow; it increases when small doses are applied on the bone marrow. Other observations dealt with irradiations of cancerous patients (atypical blood changes), of patients with hyperthyreosis, of splenectomized persons (atypical changes), and with irradiations of the skull (decrease of the erythrocyte count). (Extensive bibliography.)

6254 The Cytological Effects of Low-Intensity Radiation. Karl Sax. Science 112, 332-3(1950) Sept. 22.

The effects of long-continued exposure to low-intensity radiation have been studied by exposing potted plants of Tradescantia paludosa to low intensities of γ radiation for several months. Exposure to 1.7 r/day increased the aberration frequency up to the end of 3 weeks exposure, after which time there was no continued increase. At the end of 22 weeks the plants had received 262 r of γ radiation, but showed only 0.5% breaks in the microspore chromosomes. This dose of x-rays, given in a few minutes at the prophase stage, would have produced more than 30% breaks. The fact that both chromosome aberrations and pollen sterility level off after a few weeks of exposure indicates that the plants can survive and reproduce after months, or perhaps even years, of exposure. Unfortunately, these results cannot be expected to apply to the higher animals, including man. The factors of determinate growth, high sensitivity of critical tissues, the absence of haploid mitosis in gametophytic development, and the lack of rapid somatic divisions preceding egg formation, should render animals much more vulnerable to low intensities of ionizing radiation.

6255 Effect of Beta Irradiation on Gastric Acidity. Raymond F. Hedin, Winston R. Miller, and Demetrius G. Jelatis. Arch. Surg. 61, 748-57(1950) Oct.

The stomachs of 10 dogs were exposed to various doses of beta irradiation from P^{32} to determine the effect on gastric acidity. The capacity of the distended dog's stomach was determined, and a balloon filled with radiophosphorus solution was allowed to come in contact with the ironed-out gastric mucosa for various lengths of time. A rather striking correlation was obtained between the changes in gastric acidity and the histologic changes in the gastric mucosa after various doses of P^{32}. From the data at hand, it appears that a dosage of the order of 10,000 rep produces a marked reduction in gastric acidity for a prolonged time without complete achlorhydria. Further studies are in progress to determine whether this method of reducing gastric acidity might be safely applied to the treatment of peptic ulcer. (auth)

6256 Effects of Internal Irradiation of Mice with P^{32}. Part I: Spleen, Lymph Nodes, Thymus, Bone, and Bone Marrow. Shields Warren, Jane C. MacMillan, and Frank J. Dixon. Radiology 55, 375-89(1950) Sept.

A histologic survey of the effects of continuous internal irradiation of mice with varying dosages of P^{32} is presented. The tissue showing radiation injury earliest is the thymus,

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but the thymus also appears to possess a "radioresiliency" in that it returns to normal most rapidly and completely. Splenic tissue and bone marrow appear about the same in respect to sensitivity to P^{32}, but bone marrow is more nearly completely destroyed than splenic tissue by an equal dose. Repair and return of myelopoiesis can be seen in both tissues at 10 to 15 days following injection. The spleen becomes hyperplastic by 20 days, but the bone marrow does not become hyperplastic until some time later. Lymph nodes are the last tissue to show morphologic recovery from effects of radiation. In the group of animals given the minimal dose an overgrowth effect was observed in some of the tissues after a preliminary depressive effect. Marked lymphopoiesis, myelopoiesis, and hyperplasia occur, with resultant increase in the size of the spleen, thymus, and amount of bone marrow but not in the size of the lymph nodes, which appear permanently damaged and shrunken by this small dose. Also of interest is the histologic observation of repair and recovery in the lymphoid tissues and bone marrow. Restoration to almost normal was accomplished in some animals dying because of radiation injury.

6257 Effects of Phosphorus^{32} on the Hamster. Clem Russ. Proc. Soc. Exptl. Biol. Med. 74, 729-31(1950) Aug.

Effects of intraperitoneal injection of the hamster with radiophosphorus, P^{32}, are described. Animals treated with 10 μc/g of body weight died in 11 days. There were no apparent changes in the testes in this time. Toxic effects were observed in animals injected with as little as 6 μc/g. Damage to the testes of animals treated with 6 and 8 μc respectively, was extensive, consisting of marked decrease in size, absence of spermatogenic cells in tubules, and actual damage to the tubules themselves, suggesting permanent sterility. No changes in the testes of animals treated with 1 μc/g were apparent in 24 hr. However, some damage was observed 30 days after treatment with 1 μc. Spermatogenic cells were more sensitive than Sertoli cells. Some interstitial cells appeared to be affected. (auth)

6258 Effects of X-irradiation and Urethane Treatment on Chicken Bone Marrow Enzymes. James S. Dinning, I. Meschan, Cecilia K. Keith, and Paul L. Day. Proc. Soc. Exptl. Biol. Med. 74, 776-7(1950) Aug.

Mature hens were given a single whole-body x-irradiation of 300 r. This treatment markedly reduced the bone marrow endogenous respiration, choline oxidase, and succinoxidase. The intraperitoneal injection of urethane also reduced marrow choline oxidase, and reduced succinoxidase but to a lesser degree. Both x-irradiation and urethane treatment rendered the chickens leucopenic. (auth)

6259 Effects of X-rays on Size of Yeast Cells. Kirkland C. Brace. Proc. Soc. Exptl. Biol. Med. 74, 751-5 (1950) Aug.

When yeast cells were exposed to 20,000 r of x-rays and cultured in liquid medium, they and their descendants attained a mean cell volume more than twice that of cells derived from nonirradiated controls. On the other hand, there were no corresponding differences in specific gravity and nitrogen content per unit of cell volume. It is accordingly concluded that enlargement of yeast cells after irradiation is largely a nonselective increase in cell constituents rather than a swelling due mostly to uptake of water. (auth)

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6260 Killing of Drosophila Eggs by Energetic Rays, as a Biophysical Problem. H. Langendorff and K. Sommermeyer. Strahlentherapie 82, 316-20(1950) June 12 (in German).

A true interpretation of the killing action of energetic radiations on Drosophila eggs is conditioned by the proper knowledge of the influence of the biological variability on the shape of the killing curves. This biophysical aspect of the problem was studied in a series of experiments with 1 to 4 hr old eggs; the results pointed to a high degree of variability in younger stages of egg development and proved that many elementary ray hits were required for the killing action (in accordance with Lea's views; see his Actions of Radiation on Living Cells, Cambridge 1946, p. 332). (auth)

6261 The Mutagenic Effect of Radiophosphorus in Barley. K. F. Thompson, J. MacKey, A. Gustafsson, and L. Ehrenberg. Hereditas 36, 220-3(1950) Apr. 22.

The mutagenic effect of P^{32} on barley was studied by soaking seeds in water containing various quantities of radioactive phosphate ions and by subsequent measuring of the chlorophyll-mutation rates per spike progeny in the second generation. Radiophosphorus was found to be highly mutagenic, its mode of action lying between those of x-rays and neutrons and its mutation range being wider than that of x-rays. Since P^{32} is easy to handle, it is expected to become very useful in mutation work and plant breeding.

6262 On a Mathematical Theory of the Reaction of Cells to X-ray Irradiation. Edmund Pinney. Bull. Math. Biophys. 12, 199-206(1950) Sept.

To describe the variation of concentration of certain substances in cells subjected to x-rays for a finite length of time, R. M. Sievert (Acta Radiol. 22, 237-51(1941)) has given an equation of mixed differences involving time-lag and having discontinuous coefficients. In the present paper, Laplace transform methods are applied to solve this equation in terms of a series valid for all values of time. In particular, the conditions previously given that the concentration approaches a constant value are confirmed; otherwise, steady oscillations in concentration may be expected, or oscillations appear whose amplitude steadily increases until the cell is destroyed or the assumed mathematical model otherwise fails to apply. (auth)

6263 On the Problem of Membrane Permeability. Ladislaus Neu. Strahlentherapie 82, 257-60(1950) June 12 (in German).

It is shown that, with the aid of the author's "radiation equation" (Strahlentherapie 79, (1949); see NSA 4-2145), the membrane potentials of a living tissue, irradiated with electromagnetic waves, can be calculated if the tissue's electric conductivity is known. The membranes can be regarded as equipotential surfaces of an electric field. (auth)

6264 On X-ray Damages in the Intestine. W. Ceelen. Strahlentherapie 82, 13-22(1950) May 15 (in German).

Observations and speculations are presented on the nature of the complicated histological picture of the damages wrought by x-rays on the intestine. The first attacked are mesenchymal tissues and vessels, the resulting circulation damages provoking epithelial necroses; a characteristic prenecrotic state of all tissues ensues, preceding the

necrosoulcerative destruction of the intestinal wall, in which bacterial action cannot be clearly distinguished from that of the radiation.

6265 Preliminary Report of X-ray Effects on the Nematode Rhabditis strongyloides. Lyell J. Thomas and Henry Quastler. Science 112, 356-7(1950) Sept. 29.

The nonlethal effects of x-irradiation on the characters of adult individuals of a bisexual nematode, Rhabditis strongyloides, have been investigated. This worm appears to be different, in respect to observable changes and genetic response, from animals, plants, and bacteria used in conventional genetic studies. Exposures of 100 to 10,000 r produced no visible physical changes in the worms, 20,000 r applied to wet cultures caused the appearance of larvae with marked changes in the refractive index of the rhabditin granules of the intestine, and 40,000 r produced vacuolate, probably sterile reproductive systems, looped or spiral-like intestines, variations in egg size and shell structure, and the appearance of "dauer"-like worms. The same effects were obtained with dry cultures exposed to 40,000 r as were obtained with 20,000-r-irradiated wet cultures. These changes are shown to be genetic and to be perpetuated for generations in crowded mass cultures.

6266 Radiobiology and Its Place in Research and Therapy. H. Langendorff. Strahlentherapie 82, 1-12(1950) May 15 (in German).

Current ideas on the mechanism of the action of x-rays on living tissues are outlined. The experimenters are guided mainly by two lines of thought, corresponding to two different reactions by which the cell matter responds to hits of the photons. One is concerned with gene mutations, stable hereditary changes, irreversible or not, brought about through direct actions of x-ray quanta on the gene, transforming the latter's structure in a way analogous to allotropic transitions in a crystal; recent research in cancer etiology and therapy has followed these interpretations. The other is preoccupied with alternations, mostly reversible, due chiefly to changes in the metabolism of the cell and produced indirectly by the rays' chemical action on one of the plasma's constituents, e.g., water.

6267 Studies on the Effect of Radioactive Colloidal Gold on the Development of the Oral Structures of the Mouse. M. S. Burstone. Arch. Path. 50, 419-26 (1950) Oct.

The injection of colloidal radioactive gold, Au^{198}, adjacent to the jaw of the immature mouse will result in abnormalities of osteogenesis and odontogenesis, including failure of root formation. The changes are interpreted as being the result of local irradiation, since the side of the head farther from the injected area exhibits relatively normal development of tooth and bone structure. These changes are similar to those observed in immature mice receiving systemic dosages of radioactive phosphorus. The serous-type glands manifest a greater radiosensitivity than the mucous type. The duct elements are relatively radioresistant. (auth)

6268 Ultra-fractioning in X-ray Treatments. I. Experimental Study of the Biological Effect of an Intermittent Irradiation. E. Witte. Strahlentherapie 82, 209-22 (1950) June 12 (in German).

Experiments on the biological action of intermittent (so-called "ultra-fractionated") roentgen irradiations showed that the effects become noticeable only when the elementary periods of irradiation and intermission are very small. The effect, which is a weakening of the x-ray action as compared with that of a continuous treatment, can exceed 50%. As a working hypothesis, it can be surmised that the effect of a quantum hit within the limits of an elementary target in a living cell lasts for a certain time interval; if another hit reaches the same target before the expiration of that interval, the effect is increased; this is the case of a continuous irradiation. Experiments with 12-hr-old Drosophila pupae showed that the width of elementary targets is at least 0.1 mm (10 to 100 cells), and that the hit effect lasts for about 1/350 sec. Remarks are made on the therapeutic implications of the observed phenomena and on the construction of the instruments used. The usefulness of the above ideas for the interpretation of the biological action of betatron electrons is pointed out. (auth)

6269 Some Aspects of Radiological Defense. William H Sullivan. AD-239(L), July 24, 1950. 13p.

The relative hazards to be expected from the different types of atomic bomb explosions and the radiological defense measures to be taken for each type are discussed in this lecture presented at the Teachers' Training Course for Radiological Monitoring, at Portland, Oregon, July 20, 1950.

6270 The Hazards of Atomic Bomb Radiation. E. Kruse. Orion 5, 526-7(1950) July (in German).

A short discussion is addressed to a general audience concerning the units used to measure the effects of radiation, the lethal doses for animals and men as contrasted to the tolerable doses, the presence of radioactivity and cosmic radiation in nature, and the dangers of atomic bomb radiation.

6271 Protection against Radiation Hazards. Shields Warren and Austin M. Brues. Nucleonics 7, No. 4, 70-6(1950) Oct.

The status of our present knowledge of the effects of ionizing radiations on humans and animals is summarized. Problems of protection, the maximum permissible dose, the hazards of isotope utilization, and the dangers from radioactive wastes are discussed.

6272 Radioactive Materials in Fires. Natl. Fire Protect. Assoc. Quart. 44, 43-4(1950) July.

Municipal fire departments ordinarily need not consider the hazards of radioactivity unless a fire occurs in an area, such as a radium-dial painting plant, a hospital, or an industrial plant, where mg to g quantities of radium or similar material are handled. The department should determine in advance the locations, amounts, and types of container of any such quantities of radioactive materials in its area. Precautions should be taken during fires to avoid breathing in the material or getting it into cuts or into the mouth. The location of a Geiger counter should be known, and an attempt should be made after the fire to locate the material, and to check the clothing of the firemen. Tracer amounts of active material, such as are used in research laboratories, are harmless.

BIOLOGY AND MEDICINE

6273 Azulol, a New Synthetic Drug for Skin Reactions Caused by Radiations. Wolfgang Roeckerath. Strahlentherapie 82, 253-6(1950) June 12 (in German).

The present-day use of prolonged-irradiation techniques in the x-ray therapy implies the unavoidable appearance of dermatitis (erythematosa and excoriativa). Very efficient curative properties belong to newly synthesized hydrocarbons, azulenes, present in small and varying quantities in the camomile (Pfau et al., Helv. Chim. Acta 19-25(1936-1942)). They are used, under the name of azulol, as a 10% lanolin-vaseline ointment.

6274 A Rapid Method for the Estimation of the Glutamic-Aspartic Transaminase in Tissues and Its Application to Radiation Sickness. N. E. Tonhazy, N. G. White, and W. W. Umbreit. Arch. Biochem. 28, 36-42(1950) Aug.

A simple colorimetric method for the estimation of transaminase is described. It is based upon the conversion of aspartic acid to oxalacetic acid by the enzyme, the chemical conversion of the oxalacetate formed to pyruvate, and the colorimetric estimation of the latter. Manipulation is at a minimum and relatively accurate results are obtained rapidly. The method is applied to the determination of the transaminase activities of tissues of normal mice and of mice exposed to sublethal doses of x-radiation. Within the limits of measurement there was no significant decrease in transaminase activity in the irradiated mice from that observed in the nonirradiated controls.

6275 Absorption of Roentgen Rays with Use of a Beryllium Window Tube. M. F. Engman, Jr., E. P. Weber, and W. G. Elle. Arch. Dermatol. and Syphilol. 62, 222-9 (1950) Aug.

In order to obtain a base for further study of the clinical usefulness of the relatively unfiltered radiation from a beryllium-window x-ray tube, some preliminary studies of the absorption of the radiation in the first 4 mm of tissue have been undertaken, using polystyrene, density 1.05 to 1.08, as a phantom. The application of this radiation to the treatment of superficial skin disorders is discussed.

6276 Beryllium Window Radiations for Superficial Therapy. Anthony C. Cipollaro. Arch. Dermatol. and Syphilol. 62, 214-21(1950) Aug.

A new type of x-ray equipment of great flexibility and applicability in dermatologic roentgen therapy is described. The machine is shockproof and self-rectified and emits in great intensities extremely soft radiations, even softer than grenz rays. The emission of great intensities of soft radiation is due to a special x-ray tube with a beryllium window. Erythema and epilating doses, intensity distribution, and depth-dose data are presented.

6277 Clinical Picture and Radiotherapy of the Bone Sarcoma. Rolf Heinecker. Strahlentherapie 82, 187-208(1950) June 12 (in German).

This is an outline of the present-day experience in the radiological treatment of the bone sarcoma (many references). Only surgery combined with x-ray therapy can lead to lasting healings. Considerable symptomatic improvements through depth irradiations are attainable. Not much is known, as yet, on the effects of artificial radioactive substances.

BIOLOGY AND MEDICINE

6278 Critical Remarks on the Roentgenotherapy of the Gastric Ulcer. W. Naumann and A. Frank. Strahlentherapie 82, 223-30(1950) June 12 (in German).

None of the ten cases of gastric ulcer treated with x-rays showed a well-defined influence of the irradiation on the ulcerous tissues, the accompanying gastritis, or the pain syndrome (prolonged pain-free periods were never observed). As a rule, superacidity decreased to normal levels.

6279 Diagnostic and Therapeutic Uses of Radioactive Isotopes. I. Some General Problems in Connection with the Measurement of Radioactivity in Patients. N. Veall. Brit. J. Radiology 23, 527-34(1950) Sept.

The detection and measurement of a radioactive isotope within a patient's body by means of externally placed instruments which are sensitive to γ radiation (in vivo techniques) is applicable to (1) experiments in which the radioactivity in an organ or tissue is a function of time, and (2) experiments in which only the distribution of radioactivity at a given time is of interest. Factors essential to in vivo measurements generally include reduction of background, proper design of equipment for rapidity of manipulation, automatic recording of data, and high efficiency of the detection equipment. Consideration of all factors is illustrated by time studies of the rate of uptake of I^{131} in the thyroid gland and the use of Na^{24} in the study of peripheral vascular disease, and by distribution studies on the localization of the placental site by means of Na^{24}. A shadow-profile method of accurately positioning the patient in thyroid studies is illustrated. The equipment necessary for directional counter studies and the distribution diagrams of I^{131} in the thyroid region obtained by this method are described, and the proper choice of isotope to be used in a particular investigation is discussed.

6280 Diagnostic and Therapeutic Uses of Radioactive Isotopes. II. Some Applications of I^{131} and Na^{24} to Clinical Diagnoses. C. P. Haigh and M. Reiss. Brit. J. Radiology 23, 534-41(1950) Sept.

A method for determining the amount of iodine collected by the thyroid, as distinct from the thyroid region, has been developed. Small doses (15 to 25 μc) of carrier-free I^{131} are given intravenously, and the I^{131} uptake of the thyroid area is recorded for about 1 hr. The slope of the linear portion of the uptake curve, which is a measure of the iodine avidity of the thyroid, is normalized by dividing by the activity intercept of the extrapolated curve at zero time. This normalized uptake, k, is a function of the iodine level as well as of the thyroid avidity. The total amount of I^{131} excreted in the urine provides a measure of the blood iodine level. An index of thyroid function, I_t, is therefore obtained by dividing k by the activity excreted in 60 hr. The thyroid activities of over 400 patients have been examined with this method. Small divergencies from the normal are more readily seen than with other methods. Radiosodium, Na^{24}, has been used to investigate the circulation in and sodium uptake of the human skull and other parts of the body. The application of tracer methods to the study of thyroid and blood circulation disturbances in mental patients is discussed.

6281 Diagnostic and Therapeutic Uses of Radioactive Isotopes. III. The Application of Radioactive Isotopes in a Case of Multiple Melanomata. R. Marcus and J. Rotblat. Brit. J. Radiology 23, 541-9(1950) Sept.

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An attempted therapeutic use of radiophosphorus, P^{32}, in a case of multiple melanomatosis, a disease usually fatal within a few months of its onset, is described. Before the therapeutic treatment was started, tracer studies were made with Cu^{64}, I^{131}, and P^{32} in order to find the isotope with the highest uptake. No difference was found in the uptake of Cu^{64}—over 82% of which was taken up by the liver—or I^{131} between melanoma and normal skin. It was found, however, that the uptake of P^{32} by the melanomas was from 4 to 10 times as great as by normal skin. Two therapeutic doses of 5.4 and 15 mc of P^{32} were then administered at one-month intervals. The melanomas took up about 10% of the injected dose, and some necrosis and inhibition of growth of the malignant tissue was observed without, however, materially affecting the clinical course of the disease. A much larger initial dose might have proved more effective.

6282 Diagnostic and Therapeutic Uses of Radioactive Isotopes. IV. Radioactive Iodine in the Diagnosis of Thyrotoxicosis. Alastair G. Macgregor. Brit. J. Radiology 23, 550-3(1950) Sept.

The eventual value of I^{131} tracer diagnosis will depend on its ability to give a clear-cut separation between toxicity and normality in that large intermediate group of cases that include nontoxic goiters, anxiety states, and patients with symptoms suggestive of thyrotoxicosis, whether or not they have a goiter. The diagnostic information that may be obtained from the peak gland uptake, time to half peak, 24-hr urine excretion, plasma activity, and thyroid clearance rates of tracer amounts of I^{131} is discussed with reference to investigations in 51 noncarcinomatous individuals having thyrotoxicosis, toxic adenoma, nontoxic thyroid disease, or myxedema. Twelve normal individuals were also included in the study.

6283 Diagnostic and Therapeutic Uses of Radioactive Isotopes. V. The Treatment of Thyroid Carcinoma by Radioiodine. Ralston Paterson. Brit. J. Radiology 23, 553-9(1950) Sept.

A general discussion of the treatment of tumors and cancers of the thyroid by radioiodine, I^{131}, is given. The necessity for surgery or radioelimination of all normal thyroid tissue is discussed, and methods are suggested for causing nonfunctioning tumors to develop the capacity to take up therapeutic amounts of radioiodine.

6284 Diagnostic and Therapeutic Uses of Radioactive Isotopes. VI. Results of Treatment of Thyroid Cancer by Radioactive Iodine. A Preliminary Report. H. C. Warrington. Brit. J. Radiology 23, 556-9(1950) Sept.

Of 21 cases of thyroid cancer examined, 15 were of the nonfunctioning-tumor type. In order to see whether a certain percentage of nonfunctioning tumors will acquire the ability to concentrate I^{131} if all normal thyroid tissue is absent, thyroidectomy or a therapeutic quantity of radioiodine was used to remove or destroy all functioning thyroid tissue. Subsequent tracer studies have shown no evidence that the tumors acquired the ability to concentrate I^{131}. An attempt is made to relate the histology of the tumor types to the tracer findings.

6285 Diagnostic and Therapeutic Uses of Radioactive Isotopes. VII. Therapeutic Uses of Radioactive Isotopes in the Royal Cancer Hospital. R. J. Walton. Brit. J. Radiology 23, 559-66(1950) Sept.

Because little is yet known of the optimum size and spacing of radiation doses, only patients for whom established surgical or radiotherapeutic techniques had nothing to offer have been treated with radioisotopes. The use of a rubber sphere containing $Na^{24}Cl$ solution to treat malignant or premalignant changes in the mucosa of the bladder is described. Doses of up to 3000 r of γ radiation have been given, and a complete disappearance of a papillary carcinoma lesion is illustrated. The substitution of Br^{82}, with its much smaller β-ray contribution, for Na^{24} is being investigated. A case study of a patient having a thyroid carcinoma with associated miliary carcinomatosis of both lungs is reported. Radioiodine, I^{131}, therapy effected a complete cure. Successful palliation of rapidly growing, disseminated, radiosensitive tumors such as leukemia, lymphosarcoma, or anaplastic carcinoma has followed intravenous injection of surprisingly small amounts of P^{32}.

6286 Diagnostic and Therapeutic Uses of Radioactive Isotopes. VIII. The Use of Radioisotopes in Therapy. G. W. Blomfield. Brit. J. Radiology 23, 566-8(1950) Sept.

Case studies are given of ten patients treated with I^{131} for thyrotoxicosis. Doses ranged from 4.0 to 24.5 mc, the intention being to deliver up to 10,000 equivalent roentgens to the thyroid gland. The same cases showed little variation between their tracer take-up and their therapy take-up, and the same was observed regarding the biological half-life. The data obtained indicate that, provided the tracer estimations are carried out, a reasonable assessment of dosage is possible before treatment.

6287 Gastritis, Ulcer and Cancer. A Roentgenological Essay. J. Buecker. 89p. Stuttgart, G. Thieme, 1950 (in German).

Pathological, diagnostic, and therapeutic aspects of gastritis, ulcers, and carcinomas, in their formal and genetic relationships, are examined from the radiologist's standpoint. 82 illustrations.

6288 On the Carcinoma of the Vulva. G. Schömig and J. Breitner. Strahlentherapie 82, 115-22(1950) May 15 (in German).

Statistical and radiotherapeutic data on the carcinoma of the vulva are presented. Combined x-ray-radium treatments give somewhat better results than x-rays alone; however, a surgical operation in combination with irradiations is generally more successful.

6289 On the History of Therapeutical Applications of X-rays in Dermatology. Richard Schmitz. Strahlentherapie 82, 401-18(1950) July 7 (in German).

A historical sketch is presented of the development of the roentgenotherapy of skin diseases. While the technique has reached a certain degree of perfection, little is known on the true nature of physiological processes involved. A replacement of x-rays by fast electrons in dermatology can be foreseen. The bibliography, which starts at 1917, mentions mostly works done in German-speaking countries; for the period before 1917 see Gocht (Die Röntgenliteratur, Parts 1 to 4, Stuttgart, 1911-21).

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6290 On the Sudeck's Disease and Its Healing by Roentgenotherapy. Helmut Meyer-Laack. Strahlentherapie 82, 231-46(1950) June 12 (in German).

Vascular processes and the ensuing bone alterations of the Sudeck's syndrome should not be regarded as local sympathetic reactions, but as a reflectory functional disturbance of all sympathetic fibers involved. It was found that with appropriate x-ray treatments the healing periods were shorter by months and years than those following the usual surgical intervention. (auth)

6291 Problems on Modern Radiotherapy in the Light of Recent American Publications. Part I. G. Bonse. Strahlentherapie 82, 143-50(1950) May 15 (in German).

Recent achievements of American investigators in the field of diagnostic and therapeutic radiology are reviewed. In this first part of the work the following results are reported: Experiments on therapeutic applications of fast neutrons have been very disappointing. Of the many artificially produced isotopes, P^{32}, I^{131}, and Na^{24} were found clinically useful. The usual methods of histological diagnostics are complemented by the use of autoradiograms.

6292 Radioactive Phosphorus. I. In the Treatment of Lymphatic Leukemia. Henry D. Diamond, Lloyd F. Craver, Helen Q. Woodard, and George H. Parks. Cancer 3, 779-88(1950) Sept.

A study of 71 patients with lymphatic leukemia treated with P^{32}, with roentgen-ray radiation and P^{32}, and with P^{32} and other chemotherapeutic agents culminating a 9-yr experience is presented. The 5-yr survival rates and those reported by others are considerably in excess of the survival rates for malignant melanoma and cancer of the esophagus, pancreas, stomach, and lung. The undue pessimism concerning lymphatic leukemia reigning in the minds not only of the public, but also of the medical profession, should be dispelled by these figures. Because of the facility of handling and preparation, minimal exposure of personnel, and ease of self-administration by the patient, it is suggested that the oral route of P^{32} therapy is more economical and practical than the intravenous route.

6293 Radium Dosimetry in Uterus Carcinoma. Julius Ries. Strahlentherapie 82, 23-94(1950) May 15 (in German).

On the basis of extensive clinical material, a survey is made of physical and biological methods of Ra dosimetry in uterus carcinoma. It shows the merits of the "instant radium dosimeter" of Bomke and Eberle, a very sensitive instrument for the measurement of weak ionizing currents; it is introduced either in the rectum or the bladder.

6294 Results of the Treatment of Malignant Genital Tumors at the Gynecological Clinics of the University of Goettingen in 1937-1944. H. Czech, R. K. Kepp, and G. Wolthaus. Strahlentherapie 82, 321-54(1950) July 7 (in German).

Statistical data on x-ray therapies in various fields of gynecology are discussed. Although beneficial in certain domains, these methods should probably be considered ineffectual in other cases; other means, such as fast electrons or the new telecurie therapy will perhaps lead to better results.

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6295 Roentgenotherapy of Enuresis Nocturna? K. Breitländer. Strahlentherapie 82, 307-15(1950) June 12 (in German).

In 56 cases of enuresis nocturna treated by irradiations of the betweenbrain, 37 showed satisfactory results. This points to the central origin of the studied disturbance of vegetative functions (diuresis and reflexes of the bladder).

6296 Role of Radiation Therapy in the Control of Malignant Neoplasms of the Brain and Brain Stem. Carleton B. Peirce and Jean Bouchard. Radiology 55, 337-43 (1950) Sept.

The general principles of radiation therapy of malignant tumors of the brain and brain stem are discussed.

6297 Small-Field Irradiation of Bronchial Carcinoma. Alfred Vogt. Strahlentherapie 82, 173-86(1950) June 12 (in German).

Only an operation can heal a bronchial carcinoma; since, however, only in rare cases an operation is possible, x-ray methods for partial improvements are necessary. Those are to be attempted in the absence of secondary abscesses, the 8 to 12 week treatment consisting of small-field irradiations with rather high surface doses of 20,000 to 30,000 r. A simultaneous Ra therapy of the tumor should probably be tried.

6298 Some Results in the Roentgenotherapy of Hypophyse Tumors. Dora Nittinger. Strahlentherapie 82, 367-78(1950) July 7 (in German).

Information has been secured on long-term results (up to 13 years) of the x-ray treatment of 31 cases of hypophyse tumors, of which 21 were chromophobous tumors, 8 concerned acromegalous patients, and 2 were cases of Cushing disease. In 15 cases the treatment arrested the process; in 6 this result was obtained by repeating the treatment after a period of several years; in 4 cases no improvement was observed; in 4 cases the progress of the disease caused death; 2 died intercurrently after some visible improvement.

6299 Treatment of Papillary Carcinoma of the Thyroid with Lateral Cervical Metastases. George Crile, Jr. Am. J. Surg. 80, 419-23(1950) Oct.

Eighteen cases of papillary carcinoma of the thyroid with lateral cervical metastases are reported. Since most papillary carcinomas of the thyroid are curable by surgical excision, radioactive iodine has had only a limited application in the treatment of this type. However, all suspected carcinomas of the thyroid are given a tracer dose of 0.5 mc before operation. Following operation radioautographs are made of the tumors to determine whether or not they take up I^{131}. A case of papillary carcinoma with pulmonary and cervical metastases which has regressed after treatment with radioactive iodine is reported.

6300 The Radium Content of the Body for Individuals with No Known Occupational Exposure. John B. Hursh and Allan A. Gates. UR-119, May 18, 1950. 39p.

A similar article by the same authors has been published in Nucleonics 7, No. 1, 46-59(1950) July, and has been listed in Nuclear Science Abstracts as NSA 4-5132.

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6301 Biochemical Studies of the Rare Earth Elements. I. The Distribution of Neodymium in the Viscera. Réinosuké Hara. Bull. Chem. Soc. Japan 22, No. 4, 179-81(1949)(in French).

An isotonic solution of neodymium chloride was intravenously or intramuscularly injected into rats, and its distribution and evacuation were determined by x-ray spectroscopy. The rate of elimination is remarkably slow. Only a small amount of neodymium could be found in the combined urine and feces of the first 7 days. The element is deposited in the phagocytic viscera, such as the reticuloendothelial system and the epithelial cells of the lungs. An especially large proportion is found in the liver and spleen. None is deposited in pancreas, kidney, or heart.

6302 Biochemical Studies of the Rare Earth Elements. III. The Reaction between Protein and Neodymium Salts. Réinosuké Hara. Bull. Chem. Soc. Japan 22, No. 6, 225-7(1949)(in French).

The precipitation of proteins by inorganic (chloride, nitrate, and sulfate) and organic (acetate and propionate) salts of neodymium has been studied. Precipitation does not occur in too concentrated a salt solution, but is maximum at about 0.15 to 0.50% neodymium. Analysis of the precipitated protein shows that the equivalents of neodymium combined with 1 g of protein is constant with many of the precipitating salts. The value for egg albumin is approximately 50×10^{-5} equivalent at a pH of 5.6. From these results it is concluded that the elimination of neodymium from an organism is slow because of the formation of insoluble compounds of protein and neodymium salts which are then deposited in the reticuloendothelial system.

6303 Use of B.A.L. in Heavy-metal Poisoning. H. N. MacFarland. Ind. Health Rev. 2, No. 1, 33-5(1950).

B.A.L. (British Anti-Lewisite) appears to be of value in the treatment of poisoning by salts of As, Hg, Cd, Au, Sb, Bi, Cu, Ni, and W. Little success has been obtained in the case of Pb, U, Ag, Co, Se, and Te compounds.

6304 Clinical Evaluation of Dicumarinyl Derivatives with a Metabolic Study of the Radioactively Labeled Anticoagulants in Animals. Eric P. Hausner, Charles L. Shafer, Marion Corson, Ogden Johnson, Theodore Trujillo, and Wright Langham. AECU-933, nd. 36p.

Clinical observations in normal subjects and in patients suffering from thrombo-embolic diseases showed that 4,4′-dihydroxydicumarinyl ethyl acetate (DEA, Pelentan, Tromexan) has a quicker, more transient hypoprothrombinemic effect and less apparent side effects than does dicumarol. Animal experiments with C^{14}-labeled dicumarol and DEA indicated that the action of the latter is associated with a more rapid drop in body retention, paralleled by a higher urinary excretion rate in the first few hours following oral administration. The mode of action of the two substances is essentially the same. Maximal absorption and concentration of the radioactivity occurred 6 hr after oral administration. Maximal absorption and tissue radioactivity cannot be positively correlated with the maximal hypoprothrombinemic effect. In the case of DEA, however, there seemed to be a higher initial liver concentration and an earlier drop in the percentage of retained activity in the tissues of the animal, paralleled by a higher urinary excretion rate immediately following administration. Paper-partition chromatographic analysis suggested the presence of unchanged dicumarol and unchanged DEA both in the urine and the plasma of animals treated orally with the radioactive materials. The analyses suggested the possible production of 7 metabolites in the case of dicumarol and at least 3 in the case of DEA. Preliminary studies following intravenous injection of the labeled materials suggested an appreciable difference in the mode of metabolism of dicumarinyl derivatives following oral and intravenous administration.

6305 A Study of the Metabolism of Radioactive Strontium in Adult, Young, and Rachitic Rats. D. C. Jones and D. H. Copp. UCRL-873, Aug. 28, 1950. 10p.

The metabolism of carrier-free radiostrontium, $Sr^{89,90}$, was studied in adult, young, and rachitic rats during the critical first 24 hr following intraperitoneal injection. Radiostrontium is removed from the plasma much more slowly in the adult animals than in the other two groups. The uptake by adult bone is continuous for the first 2 hr, and reaches a maximum within 4 hr. Skeletal uptake of radiostrontium is much more rapid in the young animals, reaching a maximum within 30 min. The deposited isotope appears to remain fixed in the bone. In rachitic rats, the rapid initial uptake was similar to that in the normal young animals, but was followed by active loss from the skeleton, so that only one-third was left at 24 hr. This suggests a labile combination with bone. A large part of the dose of radiostrontium was excreted by the rachitic rats within the first 24 hr, and the plasma clearance was 10 to 15 times as great as in the normal animals. This may be due to a direct effect of rickets on excretion by the kidney. (auth)

6306 Biophysical Studies of Methods Utilizing Fluorescein and Its Derivatives to Diagnose Brain Tumors. G. E. Moore, D. A. Kohl, J. F. Marvin, J. C. Wang, and C. M. Caudill. Radiology 55, 344-62(1950) Sept.

The use of radioactive diiodofluorescein for the diagnosis and localization of brain tumors has proved feasible. Clinical studies reveal inherent weaknesses in the method, such as the size of tumor that can be detected, and the failure of certain tumors to retain a sufficient quantity of dye to make their detection practicable. Studies to demonstrate the possibility of improving the instrumentation of such a technique are outlined. The development of the scintillation counter and its advantages and limitations are sketched. Studies of the excretion of radioactive diiodofluorescein reveal that most of the dye is excreted in the bile and can be recovered from the feces. In patients with biliary obstruction, the dye is excreted wholly in the urine. It is indicated that there is little danger of I^{131} splitting off from the dye, and with a stable product no activity is found over the thyroid gland. Attempts to render brain tumors radiopaque by the selective retention or radiopaque compounds were unsuccessful.

6307 The Blood Volume in Chronic Leucemia as Determined by P^{32}-Labeled Red Blood Cells. Nathaniel I. Berlin, John H. Lawrence, and Jean Gartland. J. Lab. Clin. Med. 36, 435-9(1950) Sept.

The blood volume has been determined with P^{32}-labeled red blood cells in 24 cases of chronic lymphatic and 17 cases of chronic myelogenous leukemia. The variation of the total red cell volume for a given hematocrit is so large that it is

of little or no value for the prediction of the total red cell volume in either normal subjects or patients with chronic leukemia. Twelve per cent (3 of 24 patients with lymphatic leukemia) had low plasma volumes; 8% (2 of 24) had high plasma volumes; the remaining 19 (80%) had normal plasma volumes. Eleven of the 13 patients with myelogenous leukemia who had palpable spleens had high plasma volumes but had normal total red cell volumes. The determination of the blood volume is of considerable value in the treatment of these patients. (auth)

6308 Breakdown of Infecting Coliphage by the Host Cell. S. M. Lesley, R. C. French, and A. F. Graham. Arch. Biochem. 28, 149-50(1950) Aug. (Letter to the editor).

The fate of an infecting coliphage has been studied with P^{32}-labeled T_2r+ bacteriophage on Escherichia coli B. A tentative interpretation of the breakdown mechanism is given.

6309 Dismutative Assimilation of Carbon Dioxide. Dean Watt and C. H. Werkman. Arch. Biochem. 28, 30-5 (1950) Aug.

Sodium bicarbonate, acetate, and lactate, labeled with stable C^{13}, were used to study the dismutation of pyruvic acid carried out by cells and cell-free extracts of Micrococcus pyogenes var. aureus. The reaction is reversible with respect to lactate and carbonate. Acetate, as such, does not participate in the reverse reaction. Reversibility of the dismutation reaction represents another pathway by which carbon dioxide may be fixed and assimilated. Its importance is not known as yet. Adenosine triphosphate enhances the fixation of carbon dioxide by dismutation yet has no effect on the exchange of acetate. 15 references.

6310 Distribution of Radioactive Silver Colloids in Tissues of Rodents Following Injection by Various Routes. James C. Gammill, Brownell Wheeler, E. L. Carothers, and P. F. Hahn. Proc. Soc. Exptl. Biol. Med. 74, 691-5(1950) Aug.

Intramuscular injection of dextrin-protected Ag^{111}-radiosilver colloid results in a high concentration of the injected material at the site of injection. Intravenous injection of a dextrin-silver colloid into rats and intraperitoneal injection of a gelatin-silver colloid into mice result in deposition of the silver in highest concentration in the reticuloendothelial system. Considerable silver was eliminated through the intestines and feces. The possible causes of such elimination under the conditions of this experiment are discussed. A method of preparing tissues of small bulk for determining radiosilver activity with the G-M counter is described. (auth)

6311 Effect of Strong Iodine Solution U. S. P. (Lugol's Solution) on Thyroid Function as Measured by Radioactive Iodine Uptakes. Leon Oettinger, Jr., and Amelia Frances Wheelwright. Am. J. Diseases Children 80, 509-10(1950) Sept.

Strong iodine solution U. S. P. (Lugol's solution) has long been used in the treatment of thyroid diseases and in the preparation of the hyperthyroid patient for surgery. The amount needed to obtain the maximum effect desired, and the duration of this effect after administration of the drug was stopped, have been very difficult to determine. This problem has been investigated using radioactive iodine to measure iodine absorption from the blood stream. It is concluded from this study that, in normal children and healthy young adults, 8 to 16 drops of strong iodine solution U. S. P. will cause maximum depression of thyroid function as measured by iodine uptake. This depression persists for only a short time after use of the drug is stopped, and the uptake returns to a normal value within five days.

6312 Estimation of Blood Volume. H. S. Mayerson. Bull. Tulane Med. Faculty 9, 114-19(1950) Aug.

The methods of estimating plasma and red cell volumes, including the use of Fe^{55}, Fe^{59}, and P^{32} radioactive tracers, are reviewed, and the clinical applications of blood-volume measurements are discussed. 10 references.

6313 Index of Thyroid Function: Estimation by Rate of Organic Binding of I^{131}. Glenn E. Sheline and Dwight E. Clark. J. Lab. Clin. Med. 36, 450-5(1950) Sept.

The incorporation of orally administered inorganic radioactive-I^{131} iodide into protein-bound plasma iodine has been studied and a conversion ratio which may serve as an index of thyroid function is defined. A method is given of determining this ratio with doses of 0.05 to 0.20 mc of radioiodine and the conversion ratios of 47 patients with various thyroid states are presented. (auth)

6314 Labelling in the Glucose Deposited as Starch during Photosynthesis. P. Vittorio, G. Krotkov, and G. B. Reed. Proc. Soc. Exptl. Biol. Med. 74, 775-6(1950) Aug.

It is shown that glucose recovered from starch deposited in photosynthesis in the presence of $C^{14}O_2$ may be labeled primarily in 3 and 4 or 1 and 6 positions or evenly in all 6 positions, depending on the periods of darkness and illumination to which the leaf is subjected. (auth)

6315 Localization of Radioactive Colloids in Lymph Nodes. Leonard A. Walker. J. Lab. Clin. Med. 36, 440-9 (1950) Sept.

The quantitative uptake of radioactive colloids by lymph nodes when the colloids are introduced into the lymphatic channels has been studied. Unsuccessful attempts were made to cause colloids injected subcutaneously to enter the lymphatic vessels and localize in regional nodes. Only P^{32}-labeled casein left the site of injection, but it did not localize in the regional nodes. A method for intralymphatic injections was developed, and quantitative studies were made on the irradiation of rabbit lymph nodes by means of two Y^{90}-labeled yttrium hydroxy-citrate colloids, called the C and E type colloids. The C type colloid has an average molecular weight of 20,000, whereas the molecular weight of the E type is much higher, possibly millions. The C type gives an average concentration of radiation in the most active node 284 times that in the most active tissue. The E type average ratio is 7900. Although variation of the volume of colloid injected over the values of 0.05, 0.10, and 0.20 ml resulted in some change in the percentage uptake by the nodes, these changes were not striking. It was found that previous intralymphatic injection of yttrium colloids caused an increase in the uptake by the nodes in subsequent injections. No explanation for this effect is offered. Iodinated bovine albumin incorporating radioactive iodine, I^{131}, when injected intralymphatically in the rabbit is not taken up by the nodes. This technique for specific irradiation of lymph nodes might be of use in

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Hodgkin's disease, in primary lymphosarcoma, or in irradiation of metastases to the nodes, as in cancer of the breast.

6316 The Order of Utilization of Phosphorus Compounds in the Egg by the Chick Embryo. Herman Branson, Martin Brooks, and Pauline F. Piper. Science 112, 357-8(1950) Sept. 29.

In order to test the hypothesis that the chick embryo first utilizes the inorganic phosphorus available in the egg for building the phosphorus compounds in its tissue, 0.1 ml of an isotonic solution of P^{32}-labeled NaH_2PO_4 with an activity of 0.2 μc was injected into each egg of three groups, which were then incubated 2, 4, and 6 days, respectively. The phosphorus compounds were then separated as the average-acid-soluble, phosphatide, and residual-phosphorus fractions. The specific activity of each of these fractions decreased rapidly with the age of the embryo. It is concluded that the embryo first uses the small amount of inorganic phosphorus available, that the organic phosphorus compounds are hydrolyzed outside the embryo, and that the inorganic phosphorus produced is then taken up by the embryo.

6317 Penetrating Power of Beta Rays in Human Tissues. Heinrich Fassbender. Strahlentherapie 82, 387-94 (1950) July 7 (in German).

An explanation is given of the use of the formulas $I/I_0 = \exp(-ad)$ and $a = 0.02/E_{max}^{1.33}$, when counting β rays through body tissues in radioisotope techniques (Robley, in Advances in Biological and Medical Physics, New York, 1948, p.162). Here I_0 and I are, respectively, ray intensities before and after traversing a layer of matter d mg/cm² thick, and E_{max} is the maximal energy (in Mev) of the electrons emitted by the isotope.

6318 Plasma Iron and Saturation of Plasma Iron-binding Protein in Dogs as Related to the Gastrointestinal Absorption of Radioiron. Charles L. Yuile, John W. Hayden, James A. Bush, Henry Tesluk, and Wellington B. Stewart. J. Exptl. Med. 92, 367-73(1950) Oct. 1.

The absorption of a test amount of radioactive iron, $Fe^{55,59}$, from the gastrointestinal tract during artificial saturation of the plasma-iron-binding protein by the repeated intravenous injection of small amounts of iron was measured in three normal and four anemic dogs. It appears that the plasma iron-binding protein and its relative saturation play little role per se in the control of iron absorption.

6319 Radioiron Absorption in Anemic Dogs. Fluctuations in the Mucosal Block and Evidence for a Gradient of Absorption in the Gastrointestinal Tract. Wellington B. Stewart, Charles L. Yuile, Herbert A. Claiborne, Richard T. Snowman, and George H. Whipple. J. Exptl. Med. 92, 375-82(1950) Oct. 1.

Radioiron, $Fe^{55,59}$, has been used to study the absorption of iron from the gastrointestinal tract of normal and anemic dogs. The control of iron absorption appears to reside in the mucosa of the gastrointestinal tract. The colon absorbs very little iron. The stomach and duodenum seem to be the most active in its absorption. This suggests the existence of a gradient in the capacity of the gastrointestinal tract to absorb iron.

6320 Some Problems of Potassium Metabolism. John M. Weller and Isaac M. Taylor. Ann. Internal Med. 33, 607-12(1950) Sept.

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Some conclusions are drawn concerning the rate of exchange of potassium between human erythrocytes and plasma based on previous experiments using radioactive potassium. The possible relationship of these observations to certain clinical problems of potassium metabolism is indicated.

6321 Studies on the Metabolism of l-Valine in Phlorizinized and Fasted Animals. William S. Fones and Julius White. Arch. Biochem. 28, 145-6(1950) Aug. (Letter to the editor).

Glycogen formation involving l-valine labeled with stable C^{13} in the methyl groups has been studied in phlorizinized and in fasted rats. The methyl groups can enter into glucose and into the subsequent partial conversion to carbon dioxide.

6322 Studies on Sodium Balance in the Human Body by Means of Radioactive Sodium, Na^{24}. René Fauvert and André Loverdo. Semaine Hopitaux Paris 26, 3132-46(1950) Sept. 2 (in French).

The use of radioactive indicators has been applied to the study of the movement of sodium ions in normal subjects and in patients with pathological effusions. A mathematical study of the experimental curves of diffusion of Na^{24} injected into the bloodstream shows that it is possible to distinguish four phases in ionic diffusion, characterized by four distinct exponential curves. These data have been used in the study of the rate of diffusion through the capillary walls and in measuring the volume of extracellular space in normal and pathological states. 34 references. (auth)

6323 Thyroid Cancer in Young Adults. Robert B. Strother and Lester W. Fix. U. S. Armed Forces Med. J. 1, 275-9(1950) Mar.

Four case studies of carcinoma of the thyroid gland are presented. An example of the use of radioactive iodine, I^{131}, as a tracer in the location of lymph nodes containing thyroid tissue is included.

6324 Tissue Culture Studies. V. Analogues for Nicotinic Acid. Wayne Hull, J. C. Perrone, and Paul L. Kirk. J. Gen. Physiol. 34, 75-9(1950) Sept. 20.

The use of acetyl-3-pyridine and pyridine-3-sulfonic acid as analogues for nicotinic acid has been tested with tissue cultures of embryonic chick heart. Cell migration, appearance of the cells, and the uptake of tracer P^{32} were used as criteria for the action of the analogues. Migration of the cells could be inhibited by both compounds, but at different levels. Both produced abnormal types of cells, but not the same type of abnormality. Uptake of P^{32} was inhibited by both compounds. Addition of nicotinic acid failed to reverse the effects of the analogues at the concentrations used. (auth)

6325 Tissue Culture Studies. VI. The Effect of Medium Constituents on Nucleic Acids and Uptake of P^{32}. Wayne Hull and Paul L. Kirk. J. Gen. Physiol. 34, 81-5(1950) Sept. 20.

The effect of horse serum alone, and of embryo extract alone, was compared with that of "complete medium" on the content and synthesis of ribo- and desoxyribonucleic acids and uptake of tracer P^{32} by chick heart cultures in vitro. The factors mentioned are influenced by embryo extract in a manner similar to the effect in complete medium. Horse serum produced little synthesis of nucleic acids or uptake of tracer, giving only slightly more effect than

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Tyrode's solution alone. Cutting the tissue into smaller pieces caused considerably greater synthetic effects and retarded necrosis of the implant. (auth)

6326 The Urinary Excretion and Biologic Decay Periods of Radiomercury Labeling a Mercurial Diuretic in Normal and Diseased Man. George Burch, Thorpe Ray, Sam Threefoot, Frank J. Kelly, and Arthur Svedberg. J. Clin. Invest. 29, 1131-8(1950) Sept.

Because of the extensive use of mercurial diuretics in clinical medicine and the resultant problems of toxicity, the biologic decay rates of these substances are of importance. The rate of urinary excretion of the radiomercury of a $Hg^{203,205}$-labeled organic mercurial diuretic (Mercuhydrin) in normal humans and in patients with chronic congestive heart failure or renal insufficiency has been investigated. The percentage of injected radiomercury which was excreted in the urine, the time relationships of the diuretic effects and the urinary excretion of the mercury, the biologic decay rates of the isotopes, and other physiologic phenomena were determined from these experiments.

6327 The Use of Radioactive Iodine, Radioactive Phosphorus, and Radioactive Sodium in the Determination of Cerebral and Muscle Clearance. Joseph B. Boatman, T. R. Kendrick, F. R. Franke, and Campbell Moses. J. Lab. Clin. Med. 36, 456-9(1950) Sept.

The rate of removal of radioisotopes from an injection site is referred to as "clearance," and is considered to be a function of blood flow. The clearance of Na^{24}, I^{131}, and P^{32} from the brain and muscle tissues of rats and dogs has been determined. The order of decreasing rapidity of clearance in both brain and muscle is I^{131}, Na^{24}, P^{32}. The expression "percentage activity remaining at a stated time" provides valid statistical data for clearance measurements. It is suggested that I^{131} may be used, wherever its ease in handling and longer half-life would be advantageous, in local tissue-clearance determinations instead of Na^{24}.

6328 Utilization of Radioactive Lipides by Normal and Hypophysectomized Rats. Robert P. Geyer, James H. Shaw, and Roy O. Greep. Endocrinology 47, 108-113(1950) Aug.

The ability of normal and hypophysectomized rats to utilize octanoic acid and trilaurin labeled with radioactive carbon, C^{14}, has been studied.

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6329 Paper Chromatography of Steroids. David Kritchevsky and Melvin Calvin. UCRL-824, July 28, 1950. 7p.

A method for the paper chromatography of sterols has been developed. The separation of cholesterol and cholestenone has been achieved by using paper impregnated with "Quilon" (stearato chronic chloride) as the stationary phase and simple primary alcohols as solvents. Tritium-labeled cholesterol was used in this experiment, its movement in the impregnated paper being followed by a windowless counting tube.

6330 Indicators for Titration of Fluoride with Thorium. Hobart H. Willard and Charles A. Horton. Anal. Chem. 22, 1190-4(1950). Sept.

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In a study of colorimetric and fluorometric indicators for the titration of fluoride with thorium, the best colorimetric indicators found were, in order of decreasing effectiveness, the two-color indicators purpurin sulfonate, Alizarin Red S, Eriochromcyanin R, dicyanoquinizarin, and Chrome Azurol S. The best fluorescent indicators were pure sublimed morin and quercetin. Optimum conditions for the use of the better indicators are presented. 10 references. (auth)

6331 Photofluorometric Titration of Fluoride. Hobart H. Willard and Charles A. Horton. Anal. Chem. 22, 1194-97(1950) Sept.

A procedure is presented for the photofluorometric titration of fluoride in the presence of considerable sodium chloride, using thorium nitrate as the titrant and quercetin as the fluorescent indicator. The method may be used following alkaline decomposition of fluorocarbons or after the Willard-Winter separation. (auth)

6332 Spectrographic Microdetermination of Beryllium in Air Dust Samples. George E. Peterson, George A. Welford, and John H. Harley. Anal. Chem. 22, 1197-1200(1950) Sept.

A spectrographic method for determining beryllium in air dust samples, collected on filter paper, is applicable from 0.05 to 200 μg of beryllium per sample. The filter paper is wet- or dry-ashed, treated with hydrofluoric and sulfuric acids, and taken to dryness. After solution in hydrochloric acid, the iron, aluminum, and other metals are removed by precipitation with oxine in acetate-buffered solution. The excess oxine is removed with chloroform, and the beryllium is precipitated as hydroxide, using 2.5 mg of aluminum as a carrier. The hydroxide is dissolved in sulfuric acid, and the volume brought to 1 ml of 1 to 7 acid. Aliquots of this solution are used for the spectrographic analysis. A 0.05-ml portion is transferred to each of three cupped, waterproofed carbon electrodes containing about 45 mg of sodium chloride as spectrographic buffer and carrier. Excitation is with the direct current arc at 10 amp for 2 min. The average of triplicate density ratios of Be 2348/Al 2367 or Be 2650/Al 2367 is used as the analytical curve function. Check analyses show a relative error of $\pm 20\%$ except at the extreme lower range, and over-all recovery of the chemical procedure is 90% of the beryllium content. (auth)

6333 Summarized Proceedings of a Conference on X-ray Analysis — Leamington Spa, 1949. Brit. J. Applied Phys. 1, 161-70(1950) July.

The first session was devoted to a discussion on "the interaction of structure and chemical behavior" and the second to "Geiger counter techniques in x-ray analysis." The papers and the discussion on them are summarized in this report. Reference is also made to Professor C. A. Coulson's lectures on "Chemical Bonds, Their Shape and Their Behavior," and a brief summary of Professor M. von Laue's address on "The Absorption of X-rays" is included. 45 references. (auth)

6334 Use of Complexones in Chemical Analysis. VII. Determination of Molybdenum by Means of 8-Hydroxyquinoline. R. Pribil and M. Malat. Collection Czechoslov. Chem. Communs. 15, 120-31(1950).

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The influence of 8-hydroxyquinoline on the complex compounds formed from a number of cations and ethylenediaminotetraacetic acid (complexone) has been studied. It was found that in the presence of complexone in acetic acid and ammonium acetate medium, 8-hydroxyquinoline precipitates only hexavalent molybdenum, wolfram, uranium, and pentavalent vanadium; the other cations being completely "screened." On the basis of these facts a method has been worked out for the selective determination of molybdenum in the presence of lead, bismuth, mercury(II), cadmium, copper, iron, aluminum, chromium, beryllium, titanium, uranium, cobalt, zinc, manganese, and nickel. The pH conditions were determined for the separation and simultaneous estimation of molybdenum and uranium, molybdenum and copper, and also molybdenum and iron, each also in the presence of the foregoing elements. Examples are given of analyses of molybdenum minerals and alloys by the method described.

6335 X-ray Diffraction Study of Cerous Phosphate and Related Crystals. I. Hexagonal Modification. Rose C. L. Mooney. Acta Cryst. 3, 337-40(1950) Sept.

The phosphates of trivalent lanthanum, cerium, and neodymium have been found to be dimorphic. One phase is monoclinic, isomorphous with the mineral monazite; the other is a hexagonal structure of a new type which easily converts to the monoclinic form at moderately high temperatures. The hexagonal modification crystallizes with the symmetry of $D_6^1 - C6_22$. There are three molecules of XPO_4 in the unit hexagonal cell, where X may be La, Ce, or Nd. The cell dimensions of the three crystals have been determined, and the complete structure has been deduced. In this structure X is co-ordinated to eight oxygen atoms, four at 2.34 A and four at 2.66 A, in such a manner as to leave open, oxygen-lined channels along the hexagonal axis. The presence of zeolitic water in these channels $[XPO_4 (0 \text{ to } 0.5H_2O)]$ is probably necessary to stabilize the structure. (auth)

6336 A Test of Ideal Solution Laws for H_2, HD, and D_2. Vapor Pressures and Critical Constants of the Individual Components. Robert D. Arnold and Harold J. Hoge. J. Chem. Phys. 18, 1295(1950) Sept. (Letter to the editor).

In order to determine the approximate magnitude of the deviations from the law of ideal solutions in mixtures of H_2, HD, and D_2, dew-point pressures of several mixtures were observed at various temperatures. Calculated pressures were based on the equation for the dew-point pressure of a mixture forming an ideal solution, $1/P_d = Z_1/P_1 + Z_2/P_2 + Z_3/P_3$, which follows directly from the basic assumption that for a given component the mole fraction Z_i in the saturated vapor is proportional to x_iP_i, the product of the mole fraction in the liquid phase and the vapor pressure of the pure component, provided that the total pressure of saturated vapor is Σx_iP_i. Observed pressures are about 3% above those calculated from the equation. The estimated error in these deviations is about ±50%. Vapor pressures and critical constants of H_2, HD, and D_2 (single-component systems only) were observed in a different apparatus capable of withstanding higher pressures.

6337 The Infra-Red and Raman Spectra of COClF. E. A. Jones and T. G. Burke. J. Chem. Phys. 18, 1308 (1950) Sept. (Letter to the editor).

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The infrared spectrum of gaseous carbonyl chlorofluoride and the Raman spectrum of the liquid have been investigated. The frequencies of the observed infrared bands and Raman lines are listed, and vibrational assignments are made on the basis of a planar structure belonging to the point group C_s.

6338 On the Dissociation Energy of Fluorine. A. Eucken and E. Wicke. Naturwissenschaften 37, 233-4(1950) May (in German).

For various reasons of physico-chemical and optical nature, the accepted value 63 kcal/mol for the dissociation energy of F_2 (Wartenberg et al., Z. physik. Chem., Bodensteinfestband, 61(1931)) should be replaced by 40.2 ± 1 kcal/mol.

6339 Synthesis of Phenothiazine Derivatives for Use as Antioxidants. Nathan L. Smith. J. Org. Chem. 15, 1125-30(1950) Sept.

A series of seven phenothiazine derivatives and diarylamines were synthesized in a program designed to provide antioxidants of interest for lubricant application. The aromatic secondary amines, 3-trifluoromethyldiphenylamine, 3-trifluoromethyl-3′-methyldiphenylamine, and 3-trifluoromethylphenyl-β-naphthylamine, were prepared by condensation reactions with 3-trifluoromethylaniline. Thionation reactions converted two of the amines into the corresponding thiazine structures 2-trifluoromethylphenothiazine and 2-trifluoromethyl-8-methylphenothiazine. Cyanoethylation of phenothiazine provided β-(10-phenothiazyl)propionitrile, which was hydrolyzed to the corresponding propionic acid. The acid readily cyclized to 2,3-dihydro-3-keto-1H-pyrido(3,2,1-kl)-phenothiazine. (auth)

6340 The System Ammonium Fluoride-Potassium Fluoride-Water at 25°. Helmut M. Haendler and Albert W. Jache. J. Am. Chem. Soc. 72, 4137-8(1950) Sept.

The system ammonium fluoride-potassium fluoride-water has been studied at 25°. No new compound is formed by the two fluorides. The results of analyses of the solution and wet residues are tabulated and representative points have been plotted.

6341 Shear Tests of Graphite. J. O. Jeffrey, J. R. Moynihan, and D. F. Gunder. BNL-68, July 15, 1950. 10p.

Specimens of extruded graphite have been tested in torsion. The material fails in tension before it does in shear; hence, ultimate shear strengths are not obtained. The material deforms plastically, permanent set being obtained even for small loads.

6342 Hot Laboratory Technical Report; IV. Development of a Porous Plastic Disk and Auxiliaries. Markite Co. BNL-61, July 15, 1950. 45p.

Methods have been developed for the fabrication of porous plastic disks which can be used for the filtering of fine precipitates and may also be employed to disperse gases in liquids at low pressure differentials. The disks are extremely rugged and resistant to comparatively severe mechanical abuse and thermal shock. The material of construction exhibits outstanding resistance to most chemicals, including inorganic acids, fluorides, strong oxidizing agents, alkalies, and many organic solvents. Methods of mounting

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the disks in holders of the same plastic and of fabricating an over-all vessel assembly have been devised and analyzed. Limitations and inherent difficulties have been indicated and a a survey of pertinent prior art has been included. (auth)

6343 Establishing a Hospital Laboratory for Radioactive Isotope Therapy. Howard A. Steiner. Hospitals 24, No. 10, 37-41(1950) Oct.

The steadily increasing use of radioactive isotopes for medical applications makes desirable the development of a basic therapeutic-level radioactive isotope laboratory for hospitals. The construction, equipment, arrangement of operations, location with respect to other hospital facilities, and costs of such a laboratory are discussed. Considerable attention is paid to the necessary relations of a radioisotopes laboratory with the Isotopes Division of the Atomic Energy Commission and to the assistance that may be obtained from the Advisory Field Service Branch of this division.

6344 Action of Ionizing Radiations on Water and Aqueous Solutions. Part I. Marc Lefort. J. chim. phys. 47, 624-43(1950) July-Aug. (in French).

It is admitted that various molecules and ions, formed when water is irradiated with α- or x-rays, finally produce free radicals OH and H. This hypothesis motivated a comparative experimental study of the action of the two radiations on pure water and on aqueous solutions (I + KI, nitrate-nitrite, fluorescein) by varying such factors as dose, dissolved oxygen, pH, and temperature. Even qualitative differences were observed; thus, I is reduced by x-rays but not by α-rays. A theory is presented that accounts quantitatively for the differences in yields, etc.

6345 The Effect of Ultraviolet Irradiation on Certain Amino Acids. Klaus Schocken. June 15, 1950. 8p. (AEC File No. NP-1665.)

The amino acids phenylalanine, tyrosine, dihydroxyphenylalanine, and histidine have been implicated in the process of skin pigmentation and erythema production. Although ultraviolet irradiation of these amino acids is known to lead to conversion and decomposition in aqueous solution, no quantitative data are available. A study of the degree of their conversion and decomposition was therefore undertaken in order to find quantitative data and to use them as a means by which the effects of added accelerators and inhibitors could be judged. Quantitative studies were made of the destruction and conversion in aqueous solution under ultraviolet irradiation, with and without the influence of inhibitors. These amino acids and also trytophane were irradiated up to 180 min. Their relative stability is shown by the observation that, at 90 min of irradiation, 95% of the histidine, 34% of the tryptophane, 27% of the dopa, and 18% of the tyrosine were decomposed. For the same time period, 20% of the phenylalanine was converted into tyrosine and 1.5% of the tyrosine into dopa. Of the amino acids studied, cysteine and cystine exerted the greatest protective influence on a solution of histidine. Homocystine and methionine are less protective, and alanine and leucine exert only slight protection. (auth)

6346 Cerium Oxyfluoride and Its Lattice Structure. Wolfgang Finkelnburg and Adam Stein. J. Chem. Phys. 18, 1296(1950) Sept. (Letter to the editor).

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The existence of cerium oxyfluoride, CeOF, as a stable compound has been confirmed. It has a face-centered cubic lattice of the CaF_2 type with a lattice constant which, depending on the amount of fluorine dissolved in the lattice, varies from 5.66 to 5.73 $\pm$ 0.01 A, with reference to the Cu K_α line 1.539 A. The pure CeOF was prepared by baking mixtures of CeO_2 and CeF_3 in a small carbon arc furnace from 5 to 30 min at temperatures which were believed to be of the order of 3000°K. Quantitative transformation could be obtained if the mixture was chosen correctly. It was not possible to produce CeOF by oxidation of CeF_3. There is a marked difference in the chemical behavior of the corresponding compounds of lanthanum and cerium. Whereas LaOF could be produced by oxidation of LaF_3, CeOF apparently can be produced only by reduction of CeO_2 with fluorine. Oxidation of CeF_3 always led directly to CeO_2. Baking at 1200°C for 2 hr in oxygen did not affect LaOF appreciably, whereas temperatures above 300°C were sufficient for quantitative transformation of CeOF into CeO_2.

6347 The Crystal Structure of Lanthanide Di-silicides. Georg Brauer and Heinz Haag. Naturwissenschaften 37, 210-11(1950) May (in German).

Pure $LaSi_2$, $CeSi_2$, $PrSi_2$, $NdSi_2$, and $SmSi_2$ were obtained using reactions $Me_2O_3 + 7Si \rightarrow 2MeSi_2 + 3SiO$ or $MeO_2 + 4Si \rightarrow MeSi_2 + 2SiO$, followed by volatilization of SiO in high vacuum. The crystal structure of the above di-silicides is that of $ThSi_2$.

6348 Recent Progress in the Separation of the Rare Earths. R. Bock. Angew. Chem. 62, 375-82(1950) Aug. 21 (in German).

Since the general review by Prandtl (Z. anorg. Chem. 238, 321(1938)) many entirely new methods of separating the rare earths (scandium, yttrium, and the lanthanides) have been developed, and their purification has been improved and simplified. The most important research reported in the published literature of the last ten years is summarized in the present extensive review. Topics discussed are nomenclature of subgroups, extraction from minerals and separation of thorium and cerium, separation of the individual rare earths from the extraction mixture, the place of yttrium in the rare-earth series, and developments in systematic separation processes with special emphasis on adsorption and ion-exchange methods. The actinide series is not mentioned. 116 references.

6349 Beryllium. (From Report No. 25, British Intelligence Surveys, "The Nonferrous Metal Industry in Germany, 1939-1945"). Metal Progress 566, 570, 572(1950) Oct.

The article mentions the Siemens-Halske fluoride process of extracting beryllium. It also outlines the Degussa Chloride process based on electrolysis of beryllium chloride and the Sappi process based on reduction of crude beryllium fluoride with magnesium in the presence of either aluminum or copper to give the respective alloy. Production of pure beryllium, temper alloys, and ingots is indicated. Brief references to uses and applications are included.

6350 Exchange Studies with Complex Ions. I. The Exchange of Radiocyanide with Certain Heavy Metal Complex Cyanides. Arthur W. Adamson, Joan P.

Welker, and Milton Volpe. J. Am. Chem. Soc. 72, 4030-6(1950) Sept.

The exchange of radiocyanide with the following complexes was studied at pH ~ 10: potassium tetracyanonickelate(II), potassium tetracyanopalladate(II), potassium tetracyanomercurate(II), potassium hexacyanomanganate(III), potassium hexacyanoferrate(II) and (III), potassium hexacyanochromate(III), hexacyanocobaltate(III), and potassium octocyanomolybdate(IV). Exchange was observed to be immeasurably rapid with the di- and tetracyanides, fast but measurable in the case of potassium hexacyanomanganate(III), and negligible for the other complexes. The exchange of potassium octocyanomolybdate(IV) was found to be strongly photocatalyzed. Exchange of potassium hexacyanoferrate(II), and possibly of potassium hexacyanochromate(III), was induced in acid solution, i.e., at pH 2 to 4. This pattern of exchange data supports the viewpoint that over-all thermodynamic instability constants are misleading in predicting exchange. The postulate of decreasing exchange rate with increasing coordination number is in qualitative agreement with the results. (auth)

6351 Inorganic and Analytical Chemistry Using Ion-Exchange Resin. I. Vanadium Ion Exchange in Cation-Exchange Resin Column. Hidetake Kakihana. Bull. Chem. Soc. Japan 22, No. 6, 242-7(1949).

The behavior of quinquevalent vanadium in aqueous solution in phenol-sulfonic acid type cation-exchange columns has been studied. The vanadium is completely captured independently of the pH of passing solutions in a resin with all groups remaining H^+ saturated. In columns where only the sulfonic group is saturated with Na^+ or NH_4^+, or where all groups are saturated with Na^+, the vanadium passes quantitatively if the pH of the solution is greater than 5.0, but is partially captured if the pH is less than 5.0.

6352 Compounds for Cancer Research. V. Radioactive Sulfonamides. Francis Earl Ray and Louis Soffer. J. Org. Chem. 15, 1037-42(1950) Sept.

In continuation of the search for substances that will localize in tumor tissue the preparation of a series of sulfonamides and certain intermediates is described, with a proposed scheme for making these materials radioactive. As an example, the preparation of N,N′-di-p-tosyl-S^{35}-benzidine is given in detail. (auth)

6353 The Preparation of Radioactive Progesterone and Desoxycorticosterone Labeled in Ring A. R. D. H. Heard and P. Ziegler. J. Am. Chem. Soc. 72, 4328(1950) Sept. (Communication to the editor).

The usefulness of tagged progesterone (I) and DOCA (II) in the study of the metabolism of these hormones and of the etiology of certain diseases of mal-adaptation prompted their preparation from 3-keto-Δ-etiocholenic acid methyl ester (III). Side chain labeled I has previously been reported. Fission of III with ozone yields (55%) the corresponding open ring A keto-acid, i.e., -3.5-seco-5-oxo-17-carbomethoxy-etiocholan-3-oic acid (IV), which, as its methyl ester (V), adds, under the usual Reformatsky conditions, the elements of methyl bromoacetate (VI). Simultaneously the intermediate products undergo dehydration and cyclization back to III. Respectively, with carboxyl and methylene labeled VI, the

products are III-3-C^{14} and III-4-C^{14}. Both series of reactions have been conducted; that with the more readily available VI-1-C^{14} is reported. From III-3-C^{14}, 21-diazoprogesterone-3-C^{14} VII was obtained in the usual manner and converted to both I-3-C^{14} and II-3-C^{14} with a specific activity of approximately 250,000 cts/mg/min. All counts were determined in the windowless flow counter operating at 40 to 50% efficiency, and are expressed as disintegrations registered per minute per millimole.

6354 Synthesis of C^{14}-Sodium Cyanide from Carbon Dioxide. B. Belleau and R. D. H. Heard. J. Am. Chem. Soc. 72, 4268-70(1950) Sept. (Note).

The desirability of producing radiocyanide by simple organic reactions not requiring high temperature or pressure techniques prompted the adaptation of the following sequence of reactions. Triphenylmethylsodium carbonates readily to the crystalline triphenylacetic acid. The corresponding amide, prepared in the usual way through the acid chloride, dehydrates smoothly to the nitrile, which, because of the pronounced electrophilic properties of the component groups facilely undergoes hydrogenolysis to triphenylmethane and cyanide rather than hydrogenation to triphenylethylamine. A consistent yield of 90% or better has been achieved in each of the steps, with the over-all realization of 68 to 72% of $NaC^{14}N$ from $BaC^{14}O_3$. The purification of intermediates is not necessary.

6355 Asymmetric Degradation of Deuteriated Citric Acid. Colloquium at the Chemical Institute, University of Tübingen, May 5, 1950. Carl Martius. Naturw. Rundschau 3, 375-6(1950) Aug. (in German).

The problem of the asymmetric degradation of citric acid in organisms is discussed. Citric acid has been regarded as the first member of the "citric acid cycle," the main sequence of biological oxidation of fats, proteins, and carbohydrates. Since citric acid is a symmetrical compound, it should be degraded symmetrically by the enzymes of organisms. Recent tracer work having shown that this is not the case, the proposal has been made that aconitic acid, rather than citric acid, is the first member of the cycle. To settle this problem, dideuterocitric acid, $HOOCCD_2C(OH)(COOH)CH_2COOH$, was prepared and its degradation followed. It is concluded that the first step of the degradation, asymmetric dehydration, is caused by the steric nature of the binding of citric acid to the enzyme, and that it is unnecessary to displace citric acid from its position in the citric acid cycle. No references except authors' names are given in this review.

6356 Electrolytic Properties of Aqueous Solutions of Polyacrylic Acid and Sodium Hydroxide. II. Diffusion Experiments Using Radioactive Sodium. John R. Huizenga, Philip F. Grieger, and Frederick T. Wall. J. Am. Chem. Soc. 72, 4228-32(1950) Sept. (See also NSA 4-4586.)

The steady state diffusion of radioactive sodium ion in mixtures of polyacrylic acid and sodium hydroxide has been determined at 25°. Measurements have been made on the following solutions: stoichiometric polyacrylic acid concentration equal to 0.0151 and 0.0378N, at 9.6, 24.0, 41.3, 61.7, 81.6, and 97.9% neutralization, and for an acid concentration equal to 0.00378N at 61.7% neutralization. Similar measurements were also made on four sodium chloride

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solutions in the range of concentration 2×10^{-3} to 2×10^{-2}N. The results of these experiments were used to calibrate the diffusion cells. For polyacrylic acid-sodium hydroxide solutions, extrapolation of the results to zero neutralization yields values of the mobility of sodium ion that are in good agreement with the known limiting mobility of sodium ion in pure water. The fraction of sodium ions associated with polymer has been computed on the basis of the diffusion measurements. These results are in satisfactory agreement with those reported earlier based on transference measurements. (auth)

6357 A Tracer Study of the Mechanism of the Oxidation of CO over MnO_2. F. M. Vaĭnshteĭn and G. Ya. Turovskiĭ. Doklady Akad. Nauk S.S.S.R. 72, 297-9(1950) May 11 (in Russian).

Although one would expect oxidation-reduction reactions in the catalytic oxidation of CO in the presence of MnO_2, the use of MnO_2^{18} showed no isotopic exchanges and, consequently, no intermediate-product formation in the foregoing process. MnO_2^{18} was prepared either by the action of H_2O^{18} on commercial MnO_2, or by oxidizing manganese hydroxide, containing O^{18}, with Cl. Any interaction between CO_2 and H_2O that might be present in the catalyst was avoided by a previous heating of the latter in a vacuum at 550°.

6358 Reactions Involving Like-Charged Ions. II. The Rate of Disproportionation of Uranium(V) in Deuterium Oxide. Frederick R. Duke and Richard C. Pinkerton. AECD-2921, nd. Decl. Sept. 6, 1950. 7p.

A polarographic method of Kern and Orleman (J. Am. Chem. Soc. 71, 2102(1949)) has been used to study the stated reaction. It is tentatively concluded that the reaction does not proceed by the mechanism of hydrogen atom transfer but that a hydroxyl radical transfer or its equivalent seems most likely. 10 references.

6359 Ionic Species of Tetravalent Uranium in Perchloric and Sulphuric Acids. R. H. Betts and Rita M. Leigh. Can. J. Research 28B, 514-25(1950) Aug.

A quantitative study of the extraction of tetravalent uranium into benzene by the action of the organic chelating agent thiophenoyl trifluoracetone is described. Data are presented to show that the uranous ion exists mainly in the quadruply charged form in solutions of perchloric acid. It is extracted into benzene as a neutral molecule containing four chelate groups per metal atom. At least two complex species, $U(SO_4)^{++}$ and $U(SO_4)_2$ are present in sulfuric acid solutions. Values of the association constants for the formation of these complex species are given. (auth)

6360 Preparation and Properties of the Sulfides of Thorium and Uranium. E. D. Eastman, Leo Brewer, LeRoy A. Bromley, Paul W. Gilles, and Norman L. Lofgren. J. Am. Chem. Soc. 72, 4019-23(1950) Sept.

The stable phase regions of the uranium and thorium sulfides have been determined. Methods of preparation of the pure compounds have been found, and many of the properties of these sulfides have been studied. Several of the sulfide phases show considerable promise for use as refractory containers. The distribution of "d" and "f" electrons is discussed, and the types of bonding in the semi-metallic sulfides of two and three oxidation states are discussed. (auth)

ENGINEERING

6361 Characteristics of Diffusion Pumps. R. Witty. Brit. J. Applied Phys. 1, 232-7(1950) Sept.

The essential characteristics of a diffusion pump are discussed, and apparatus and methods for determining them are described. The comparison of the performance of different pumps is discussed, and as an example, experimental results are given for the relation between performance and gap width. Finally, theories of diffusion pump operation are discussed in the light of these experimental results and some future lines of experiment are indicated. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

6362 The Preparation of Crucibles from Nitrides. L. W. Forbes, Jr., L. S. Foster, L. B. Friar, L. S. Moody, L. M. Redman, W. C. Schumb, W. Smith, J. M. P. Benedict, and A. M. Zais. AECD-2942, July 1945. Decl. Mar. 23, 1950. 136p.

Methods developed for manufacturing TiN and ZrN consisted of first forming the corresponding hydride and then coverting it to the nitride by reaction with ammonia. Crucibles were made by standard ceramic techniques and fired in high-temperature induction furnaces. Hydrostatic pressing gave crucibles with very low porosities. Boron nitride showed promise as a crucible material and as an insulating material for the construction of high temperature furnaces. Iron and cerium could be melted in nitride crucibles without appreciable contamination, but beryllium could not. (auth)

6363 The Formation and Crystal Structure of Silicon Carbide. A. Taylor. Brit. J. Applied Phys. 1, 174-81(1950) July.

The presence of cubic β-SiC has been identified by x-ray photographs when graphite and silicon are heated together at temperatures as low as 1150°C. When vitreous silica is heated with graphite the carbide is formed, at 1450 to 1475°C, probably by a vapor phase reaction. No matter how the starting materials may be varied in nature and in proportion, face-centered cubic carborundum is always formed, unless the temperature is in the region of the decomposition point. Near 2000°C face-centered cubic carborundum begins to decompose, as shown by the presence of graphite lines in an x-ray photograph, and lines corresponding to the hexagonal modification II appear. Light green commercial carborundum shows faint graphite lines when heated at 2000°C, while at 2050°C it turns black and a large amount of macrocrystalline graphite is formed. The long soaking periods, high vapor pressure, and high temperature conditions occurring in commercial processes favor the formation of large crystals of modification II. The evaluation of the Debye-Scherrer photographs from commercial silicon carbides show that the elementary tetrahedra which form the basis of the structures are slightly distorted, being expanded in the c direction and compressed in the direction of the a-axis. A possible wurtzite type, not so far reported in the literature, was looked for, but without success. 24 references. (auth)

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6364 On Zirconium Dioxide in a Mullite Refractory. D. S. Belyankin and V. V. Lapin. Doklady Akad. Nauk S.S.S.R. 73, 367-9(1950) July 11 (in Russian).

A petrographical examination was made of a mullite refractory prepared, according to Litvakovskiĭ's procedure, by electric melting of a kaolin-bauxite mixture to which a zircon concentrate had been added. Chemically, the product contains about 21% SiO_2, 7.5% ZrO_2, 2.5% TiO_2, 1% Fe_2O_3, 67% Al_2O_3, and 0.5% CaO. In fabrication and under working conditions (in glass industry) it has displayed certain good qualities of uniformity and durability. In spite of zircon's high melting point and chemical stability, the microscope revealed the intimate part played by zirconium-dioxide crystals in the crystallization of the melt. However, this microstructure does not seem to be sufficiently homogeneous. Two microphotographs.

6365 A Survey of Ceramics for Nuclear Reactors. R. F. Geller. Nucleonics 7, No. 4, 3-17(1950) Oct.

The use of ceramics, or metal-ceramic combinations, for shields, moderators, fuel rods, and coatings in thermal piles operating at temperatures in excess of about 1000°C, offers the only practical alternative to the use of metals. The physical properties of 24 ceramic materials are tabulated and discussed, with special emphasis on properties of interest in nuclear engineering. Possible ceramic applications in nuclear reactors and methods for preliminary evaluation of ceramic materials are outlined. 60 references. (auth)

6366 Absorption of Nitrogen by Zirconium and Iron. Shizuo Fujiwara. Bull. Chem. Soc. Japan 23, No. 1, 20-2(1950) May.

As part of a detailed study of the nitride formation of zirconium, ferrozirconium, and pure iron, the increase in weight of these metals when heated in an atmosphere of purified nitrogen has been measured. The absorption curve of iron has sharp breaks indicating the formation of the nitrides of α and γ iron. The addition of zirconium causes the absorption curve to be less steep. It is concluded that nitrogen absorption by zirconium is a different process from the absorption by iron.

6367 Arc-cast Molybdenum-base Alloys. First Annual Report. John L. Ham. Climax Molybdenum Company of Michigan. April 1, 1950. 166p. (AEC File No. NP-1652.)

Seventeen potential binary Mo-base alloy systems have been examined by studying material prepared by the arc-cast process. Some of the 17 elements were found to serve as deoxidizers only, some were effective both as deoxidants and alloying elements, and some were effective as alloying elements only. A classification of the elements according to their solid solubility in molybdenum has been made. In systems of limited solubility, excess phases have been recognized and in some cases identified on the basis of existing equilibrium diagrams, which for the most part have been developed from alloys prepared by powder metallurgy processes. The effects of the elements on the hardness of molybdenum at room temperature and at elevated temperatures are reported. An appraisal of the possibility of hot working the alloys was gained from a simple forge hammer test at selected temperatures and from a standarized extrusion test at 2500°F. The susceptibility to control of the hardness by annealing and/or precipitation hardening was examined. (auth)

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6368 Dissolution of Aluminum Due to Cathode Polarization. B. Kabanov and A. Zak. Doklady Akad. Nauk S.S.S.R. 72, 531-4(1950) May 21 (in Russian).

Cases are known of increased corrosion rates under the influence of cathode polarization. The authors observed rapid dissolution of Al cathodes, due to cathode polarization produced by currents of 1 to 10 a/cm² in the presence of alkaline solutions (LiOH, KOH, NaOH). The phenomenon was explained by assuming a formation of a surface alloy of Al and the alkali metal. Various tests eliminated other interpretations, such as the influence of temperature and alkali concentration in the vicinity of the cathode, the reduction of a hypothetical Al-oxide film, or the adsorption of alkali-metal ions.

6369 The Electrochemical Character of the Corrosion of Metals in Liquid Dielectrics. L. G. Gindin. Doklady Akad. Nauk S.S.S.R. 73, 515-18(1950) July 21 (in Russian).

An experiment is described disproving the accepted view that the corrosive action of liquid dielectrics is not an electrochemical phenomenon but a direct process similar to a dissolving or to the action of dry gases. A Mg plate with a Fe dowel riveted into it served as a model of a binary alloy with Fe microelements and Mg macroelements; the plate was acted upon by a typical dielectric, viz., by a solution of acetic acid in isooctane. The microscope showed that in the corroded surface of both metals the contact played a special role; a 0.2-mm wide Fe ring remained intact, while the adjoining Mg layer was severely attacked. These typical features of an electrolytical corrosion, combined with a sudden 1-v potential drop at the Mg-Fe contact, proved the electrochemical nature of the process, which must be much more pronounced in the true scale of microelements of an alloy.

6370 Heat Resistance of Zirconium in Several Mediums. E. T. Hayes, A. H. Roberson, and R. H. Robertson. J. Electrochem. Soc. 97, 316-23(1950) Oct.

Zirconium sheet was heated in carbon monoxide, carbon dioxide, hydrogen, sulfur dioxide, propane, and steam at atmospheric pressure. Weight changes and tensile properties were determined, metallographic structures were discussed, and safe heating temperatures for the metal exposed to the various gases were deduced. (auth)

6371 Hydrophobic Properties Imparted to Metal Powders as a Protection against Corrosion. A. I. Levin and A. V. Pomosov. Doklady Akad. Nauk S.S.S.R. 72, 1075-8(1950) June 21 (in Russian).

In a former investigation (Zhur. Priklad. Khim. 12, 592(1949)) the authors found that the corrosion of metal powders is due to the presence of a film of adsorbed water. Attempts are described to impart hydrophobic properties to powders by producing adsorbed films of certain organic compounds, such as oleic and anthranilic acids, sodium oleate, sodium soap, and thiocresol (in alcohol or NaOH solutions). Electrolytic copper powders were treated with water containing one of the foregoing "stabilizers," then dried in vacuum at 110 to 120°. Tests comprised wetting experiments with water, acids, and alkalies, and 24-hr-long corrosion tests with water-saturated CO_2 at 40°. The results were very satisfactory; thus, by using soap solutions, resistance to corrosion was found to be 50 to 70 times higher than in the case of powders treated by usual methods. Another welcome

fact is the "dispersing" action of the stabilizers; the dendritic crystals forming the Cu powder are, under the pressure of the adsorbed substance, disaggregated into smaller grains. Parallel experiments with tannin, glucose, and gelatin showed a much weaker anti-corrosive effect; these substances have been recommended by Moore (U. S. Pat. 1,254,056 (1918)) who assumed that they formed colloidal protective films.

6372 Improvements in Methods for the Reduction of Zirconium Chloride with Magnesium. W. J. Kroll, W. F. Hergert, and L. A. Yerkes. J. Electrochem. Soc. 97, 305-10(1950) Oct.

It is shown that gaseous zirconium chloride can be piped to a reactor containing magnesium and that the reaction salts can be repeatedly tapped to make room for more magnesium in order to continue the reduction. This permits using the crucible capacity more fully, with consequent reduction of the production cost. Experiments indicate that part of the magnesium used for the reduction of zirconium chloride can be replaced with sodium. The advantages and disadvantages of this proposition are discussed. Cast iron is a better crucible material than mild steel when used in contact with hot zirconium. A layer of zirconium carbide is formed by zirconium diffusion, which helps reduce iron contamination. (auth)

6373 Molybdenum as a Heat-resistant Metal. Robert M. Parke. Battelle Memorial Institute. Apr. 10, 1950. 118p. (AEC File No. NP-1649.)

Information obtained in connection with the planning and direction of a program of research on molybdenum is presented. Uses, source and availability, properties, processes, fabrication, high-purity preparation, molybdenum-base alloys, tungsten-molybdenum thermocouples, metallography, oxides, protection against oxidation at high temperature, cast molybdenum, and standard free energy data for some reactions involving molybdenum are covered. 247 references.

6374 On Regularities in the Creeping of Metals. V. I. Likhtman. Doklady Akad. Nauk S.S.S.R. 72, 1079-82 (1950) June 21 (in Russian).

An equation is derived for that stage of metal creeping which takes place at comparatively low temperatures and consists of a nonstationary deformation whose velocity decreases to zero as a result of the growing strengthening of the metal. The equation gives the deformation as a function of its velocity and of the time, the parameters being the strengthening and viscosity coefficients. It was experimentally tested for the case of monocrystals of tin; one of the results, viz., the value of the strengthening coefficient, agreed with that found by Kuznetsov (Physics of Solids, vol. 4, Tomsk, 1947, in Russian) for coarse-grained polycrystalline samples of tin. The equation presents significant analogies with those derived by Rebinder et al. (Doklady Akad. Nauk S.S.S.R. 71, No. 1 (1950)) for certain colloidal systems.

6375 Past Work on Fatigue of Metals in the High Temperature Field; Technical Report No. 17 on the Behavior of Materials under Repeated Stress. Thomas J. Dolan. University of Illinois. June 1950. 48p. (AEC File No. NP-1650.)

A review is made of the principal concepts of high temperature fatigue behavior of metals as obtained from laboratory investigations. The interaction between time-dependent creep, and cycle-dependent fatigue phenomena apparently results in a rate of progressive damage which may be quite different from that predicted from simple superposition of effects obtained in separate tests. In evaluating the significance of data from high temperature fatigue tests, the following factors are given careful consideration: (a) the frequency of repetition of the stress cycle; (b) the metallurgical instability of most metals at high temperature; (c) the influence of surface effects (erosion, oxidation, or chemical changes); (d) the accentuation of time-dependent creep caused by the superposition of a mean or steady stress; and (e) the lack of knowledge regarding the reduction of fatigue strength caused by "stress raisers." It is concluded that fundamental information is needed on the nature of the phenomena limiting the life of a metal in high temperature fatigue before accurate methods can be evolved for prediction of useful service life of specific components. 47 references. (auth)

6376 Phase Relationships in the Binary Systems of Nitrides and Carbides of Zirconium, Columbium, Titanium, and Vanadium. Pol Duwez and Francis Odell. J. Electrochem. Soc. 97, 299-304(1950) Oct.

Previous investigators have shown that the binary systems involving the monocarbides of zirconium, niobium, tantalum, titanium, and vanadium are of the solid-solution type, with the exception of ZrC-VC, the components of which are almost completely insoluble in each other. In the present study it is shown that the mononitrides of zirconium, niobium, titanium, and vanadium, which have the same NaCl type crystal structure as the corresponding carbides, are also soluble in each other, with the exception of the pair ZrN-VN. As in the case of the carbides, this exception can be explained on the basis of the atomic size rule governing the formation of solid solutions. Furthermore, it is established that most of the binary systems formed by a carbide and a nitride are of the solid solution type, provided the atomic diameters of the metal atoms do not differ by more than about 15%. The systems involving zirconium carbide with the nitrides were not investigated because zirconium carbide decomposed in a nitrogen atmosphere at high temperature. (auth)

6377 Relationship between the Diagram of State of an Alloy and Its Corrosive Properties. Yu. A. Kl'achko and S. A. Shapiro. Doklady Akad. Nauk S.S.S.R. 72, 707-9(1950) June 1 (in Russian).

By determining maximal corrosion rates of Mg-Sn and Mg-Al alloys, the relationship was shown between the diagrams of state of the two systems and their corrosive properties. Plates of alloys were dissolved in HCl, and the rates of liberation of H were measured. The results illustrated the role played by solid-solution and heterogeneous phases, and by eutectic points, in the corrosion.

6378 On the Equilibrium of the Radioactive Elements in the Hydrosphere. III. On the Ratio of Thorium Emanation to Radium Emanation in the Hydrosphere. Kazuo Kuroda and Yuji Yokoyama. Bull. Chem. Soc. Japan 22, No. 1, 34-42(1949).

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The ratio of thorium emanation to radium emanation in some of the mineral and hot springs of Japan has been measured by the use of a fontactoscope and by an indirect method in which the radioactivity of the decay products is deposited on negatively charged wires and measured with a Lauritsen electroscope. Ratios of 10 or higher have been found in some springs and in the surrounding atmosphere. Thorium emanation is widely distributed in the mineral and hot springs of Japan. The value of 450 Mache units found in one spring may be the highest ever observed.

6379 On the Equilibrium of the Radioactive Elements in the Hydrosphere. IV. On the Ratio of Thorium X to Radium in the Hydrosphere. Kazuo Kuroda and Yuji Yokoyama. Bull. Chem. Soc. Japan 22, No. 1, 43-5(1949).

The thorium X (Ra^{224}) and radium (Ra^{226}) contents of some mineral and hot springs of Japan have been estimated by coprecipitation with barium sulfate and measurement of the radioactivity of the precipitate with a Lauritsen electroscope. Ratios of thorium X to radium as high as 8 were found. The relations between the thorium X: radium ratio, water temperature, radium content, and radon content are discussed.

6380 Uranium Procurement Policies. Jesse C. Johnson. Earth Science Dig. 5, No. 2, 13-17(1950) Sept.

The status of the mining industry on the Colorado Plateau, with reference to the production of vanadium-uranium ores, is briefly indicated. Government policy on ore purchases is reviewed and an ore-buying schedule for ores having a uranium content of 0.20% U_3O_8 or more is presented.

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6381 Progress Report in Radiochemistry, November 1, 1949, to April 30, 1950. Adolf F. Voigt, Ruth I. Powers, R. E. Hein, Warren J. Heiman, and Burton J. Thamer. ISC-110, June 15, 1950. 21p.

The Half-Life of Sr^{90}. The decay of two samples of Sr^{90} have been followed for 7 yr by means of a Lauritsen electroscope. Sample 1, read with 746 mg/cm² of aluminum absorber, gave a half-life of 20.0 yr, and sample 2, read with 714 mg/cm², gave 19.7 yr. The half-life of Sr^{90} is, therefore, taken to be 19.9 ± 0.3 yr.

Radioactive Isotopes of Gadolinium. The principal part of the work on this topic has been published as document AECU-843, which is abstracted in Nuclear Science Abstracts as abstract 4-5055. Additional information is given in the present report. The presence of K-conversion electrons (54 kev) and possibly Eu M-series x-rays from the Gd^{153} 102-kev γ-ray have been detected. As the energies of the M- and L-conversion electrons from the 102-kev γ ray are very similar, it is not possible to corroborate the presence of the M x-rays with the corresponding conversion electrons. As analysis of the combined Eu^{152} and Eu^{154} decay curve which now extends over 560 days indicates a half-life of 7.5 ± 1 yr.

Radioactivities of Germanium, Arsenic, Gallium, and Zinc. This report is reproduced in its entirety.

Radioactivities were produced by the fast (pile) neutron irradiation of germanium. Chemical separations followed by decay and absorption measurements yielded the following results. Eleven-day Ge^{71} decays with the emission of positrons with maximum energy of 0.65 Mev. Ge^{77}, with

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12-hr half-life, emits 0.31-Mev γ rays. The half-life of As^{77} is 38.0 ± 0.5 hr and it emits 0.68-Mev β particles and two γ rays. The following new gallium and zinc activities are observed but are not assigned definite mass numbers. A 14.5-day gallium activity emits particles with maximum energies of 0.29 and 0.71 Mev, 34-kev γ rays, and possible x-rays; a 53-hr gallium activity gives off 1.9-Mev β particles and 1.63-Mev γ rays; and a 14-day zinc activity decays with the emission of 2.1-Mev β particles and 40-kev γ rays. (auth)

Complexes of Ruthenium. Attempts have been made to extract ruthenium in the quadrivalent state from aqueous nitrate solutions with complexing agents which, by forming chelate rings or through some other mechanism, produce a complex soluble in and extractable into organic solvents. A total of 27 organic complexing agents, which are listed, were tested at pH values from 3.35 to 8.75, using Ru^{106}-Rh^{106} as a tracer to measure the extraction. The general results were negative.

Zirconium-Chloranilate Complexes. To reduce effects of hydrolysis and polymerization, zirconium was studied in 1M to 2M perchloric acid with lithium perchlorate to keep the ionic strength at 2. In 2M perchlorate solutions the dissociation constants of chloranilic acid (2,5-dichloro-3,6-dihydroxyquinone) were determined to be $(84 \pm 4) \times 10^{-3}$ and $(38 \pm 1) \times 10^{-4}$ by spectrophotometric measurements. The second ionization is of more than usual strength, relative to the first, because of the strong resonance in the doubly negative ion. At zirconium and chloranilic acid concentrations near 10^{-5}, only the 1:1 complex is formed in appreciable concentrations. It has a deep magenta color and appears to be quite useful as a colorimetric analytical test for zirconium. In its formation, two hydrogen ions are liberated per zirconium ion complexed. The stoichiometric instability constant is $(175 \pm 2) \times 10^{-8}$. In addition to this, at concentrations of excess chloranilic acid in the neighborhood of 10^{-4} to 10^{-3}, a second complex is formed. It has a ratio of 1 to 2 for zirconium to chloranilic acid. In its formation from the first complex, 1.8 ± 0.5 hydrogen ions are liberated. Assuming two hydrogen ions to be involved, the instatility constant of the second complex going to the first is $(17 \pm 1) \times 10^{-5}$. (auth)

6382 The Acceleration of Dust Grains by Supernovae. Bertram Wolfe, P. McR. Routly, A. S. Wightman, and L. Spitzer, Jr. Phys. Rev. 79, 1020-1(1950) Sept. 15 (Letter to the editor).

The suggestion of Spitzer (Phys. Rev. 76, 583(1949), abstracted as NSA 4-1378) that the pressure of radiation from supernovae might accelerate dust grains in the galaxy and thus generate heavy cosmic-ray particles, is examined in the light of several effects which much reduce the maximum grain velocities, and which make it unlikely that this proposed process can in fact produce many of the observed heavy cosmic-ray particles.

6383 Angular Distribution of Cosmic Rays in the Stratosphere. S. N. Vernov and A. M. Kulikov. Doklady Akad. Nauk S.S.S.R. 73, 483-6(1950) July 21 (in Russian).

Angular distribution of cosmic rays at altitudes from 10 to 29 km was measured in several balloon experiments, with the aid of a 3-counter telescope and 1 lateral counter, the telescope counters being separated by Al (4 cm) or Pb (8 cm)

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absorbers; the instrument rotated continuously about a horizontal axis between 0 and 90°. By assuming an isotropic primary radiation, and neglecting the energy of neutrinos, it was calculated from the experimental findings that only a small fraction of a primary's energy is transmitted to secondaries deviating by more than 20° from the direction of the primary, that the energy of such deviating particles is less than 2×10^7 ev, and that disintegrating nuclei are present in the stratospheric hard component.

6384 A Determination of the High Altitude Latitude Dependence in Cosmic-Ray Neutron Intensity. William P. Staker. Phys. Rev. 80, 52-7(1950) Oct. 1.

High altitude flights have been made with balloon-borne neutron-detecting equipment. A maximum neutron density was found at an absorption depth of 110 g/cm² at 30.4°N and 100 g/cm² at 54.7°N geomagnetic latitude. The maximum neutron density at 54.7°N is approximately 2.9 times as great as the maximum neutron density measured at 30.4°N. The total integrated neutron density at 54.7°N is ~2.4 times as large as that at 30.4°N. These results indicate a latitude effect for neutron densities greater than for total ionization, but less than that for primary particles, thus corroborating present theories of neutron formation.

6385 The γ-Ray Spectrum Resulting from Capture of Negative π Mesons in Hydrogen. Wolfgang K. H. Panofsky, Lee Aamodt, James Hadley, and Robert Phillips. Phys. Rev. 80, 94(1950) Oct.1 (Letter to the editor).

The γ-ray spectrum resulting from the capture of π^- mesons in hydrogen shows that both the processes $\pi^- + p \rightarrow n + \gamma$ and $\pi^- + p \rightarrow n + \pi^0, \pi^0 \rightarrow 2\gamma$ were present, with a branching ratio $\Gamma_{\pi^0}/\Gamma_\gamma = 0.96 \pm 0.20$. The mass difference $M_{\pi^-} - M_{\pi^0} = 10.6 \pm 2.0$ electron masses was determined from the spectrum.

6386 A Mixed Shower of Nuclear Origin. M. S. Sinha. Phys. Rev. 79, 1025-6(1950) Sept. 15 (Letter to the editor).

A cloud chamber photograph of a shower in Pb shows a downward cone containing penetrating particles and an upward cone, at 180 deg to the other, comprised of soft particles. There are, in all, more than 200 tracks, believed to be caused by the interaction of an incident particle with a Pb nucleus, the particle having first traversed 13 cm of Pb.

6387 Note on the Heavy Nuclei of the Cosmic Radiation. A. D. Dainton and D. W. Kent. Phil. Mag. 41, 963-6 (1950) Sept. (Letter to the editor).

Recent experiments in this laboratory with plates exposed at 68,000 ft, showed the presence of substantial numbers of heavy particles at this altitude. The observations have allowed determination of the characteristics of the flux of heavy particles at this altitude. The deduced values of the intensity of the heavy nuclei at the top of the atmosphere, and their mean free path, are in good agreement with the results of other workers.

6388 On the Creation of Mesons by Cosmic Rays. M. Teucher. Naturwissenschaften 37, 260-2(1950) June (in German).

The following picture could bring a decision between the "multiple" and the "plural" theories of meson generation during nucleonic collisions. A star produced otherwise than through an evaporation of a nucleus could, in the "multiple" theory (several mesons from one collision), be interpreted as due to a collision between a nucleon and a proton, whereas for the "plural" conception (a "cascade" of one-meson producing collisions) the picture would be hardly intelligible. In an Ilford G5 plate, exposed at 2963 m altitude, the author found an example of such a picture in a 7-prong star from a proton-proton collision, with one prong ending in another star. The prongs comprised the primary particle, 4 mesons, and 2 electrons; the energy of the primary was 2800 Mev. It is assumed that in the collision the two protons (through a frequently observed charge-exchange process) were transformed into neutrons.

6389 On the Density Transition Effect in Electron-Nuclear Showers. M. I. Podgoretskiĭ, A. I. Barchukov, and D. F. Rakitin. Doklady Akad. Nauk S.S.S.R. 73, 685-8(1950) Aug. 1 (in Russian).

Zatsepin (Doklady Akad. Nauk S.S.S.R. 67, 993(1949)) has found that in showers of electrons and nuclei some of the latter are able to produce new nuclear disintegrations ("nucleo-active" particles). This phenomenon, called a "nuclear cascade" process could be properly termed a cascade only if more than one nucleo-active particle were formed during each event. An answer can be supplied by a phenomenon called "density transition effect" (Birger et al., Zhur. Eksptl. i Teoret. Fiz. 19, 826(1949)) reflecting the fact that the probability of a simultaneous formation (in dense matter) of two showers by two particles generated in a previous shower may not be equal to the probability of formation of two consecutive showers. It is shown that the presence of such an effect proves the existence of a cascade-like multiplication of nucleo-active particles. Using this method, experiments (at various altitudes with compensating absorbers) demonstrated the existence of nuclear cascade processes started by primaries whose energies were not sufficient for the generation of extensive atmospheric showers.

6390 The Primary Specific Ionization and Intensity of the Cosmic Radiation Above the Atmosphere at the Geomagnetic Equator. S. F. Singer. Phys. Rev. 80, 47-51(1950) Oct. 1.

Directional intensities and the primary specific ionization of the charged cosmic-ray flux above the atmosphere were measured by means of a G-M counter telescope in an Aerobee sounding rocket launched at the geomagnetic equator. The intensity at a zenith angle of 45 deg, averaged over all azimuths, was found to be 0.04 particle sec^{-1} cm^{-2} $sterad^{-1}$, of which not more than 65% can be attributed to primaries, the remainder being caused by albedo. The low value (~40%) of the observed east-west asymmetry is most directly explainable in terms of positive proton primaries and a large albedo flux at large zenith angles, although a small contribution of negative primaries cannot be excluded. The primary specific ionization of the radiation above the atmosphere is found to be essentially the same as that of the sea-level radiation, indicating a predominance of single charged particles of near minimum ionization. This result strongly suggests that the albedo radiation at the equator does not consist of low energy (<100 Mev) protons. Most of the properties of bursts produced in a small lead block can reasonably be accounted for in terms of known initiating particles and interactions. (auth)

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6391 A Floating Double Probe Method for Measurements in Gas Discharges. E. O. Johnson and L. Malter. Phys. Rev. 80, 58-68(1950) Oct. 1.

Measurements with a Langmuir probe in varying or decaying plasmas are defeated by the fact that the plasma potential in these cases follows that of the most positive electrode it can contact. The difficulties can be obviated by the use of a pair of probes joined by a variable potential source. The double probe system "floats" with respect to the discharge system. From the measurements of probe current versus differential probe voltage, electron temperature and plasma densities can be determined. The method is also applicable to "going" discharges where it has the advantage over the single probe of exerting a negligible influence on the discharge.

6392 A Study of an Electron Focusing System in an X-ray Tube. J S. Thorp. Brit. J. Applied Phys. 1, 144-9 (1950) June.

The distributions of electron density in typical foci obtained with a simple electron focusing system in a demountable x-ray tube have been determined by a combination of electrolytic trough and ray tracing methods. On the simplest electron-optical basis good qualitative agreement is obtained with the foci observed experimentally, but the observed focal dimensions are always found to be greater than those predicted. The effects of thermal energies of emission and of mutual repulsion are discussed, and it is suggested tentatively that the quantitative discrepancy is due to space charge effects. 10 references. (auth)

6393 Carbon-Isotope Ratios in Meteorites. A. V. Trofimov. Doklady Akad. Nauk S.S.S.R. 72, 663-6(1950) May 1 (in Russian).

Ratios C_{12}/C_{13}, measured in 39 meteorites (of the iron, stone, and mixed classes), were found to lie within the narrow limits of 89.6 to 91.8%; no correlation was observed between this ratio and the total C content that varied between 0.01 and 2.6%. A comparison with the average C_{12}/C_{13} ratio for earth objects (90.3%) confirms the recent views in meteorite astronomy which ascribe to almost all of these bodies a common origin with the solar system. Since, on the other hand, band spectra of carbon stars show a much higher C_{13} content, it can be concluded that the evolution of elements was different in various parts of our Galaxy.

6394 Isotopic Composition of Oxygen in Carbonates and Its Dependence on the Temperature. R. V. Teĭs. Doklady Akad. Nauk S.S.S.R 72, 73-6(1950) May 1 (in Russian).

When carbonates crystallize from water, oxygen isotopes are distributed in such a way that the crystals become enriched in heavy O isotopes; this enrichment decreases with growing crystallization temperature. Regularities that have so far been observed permitted, e g., an estimation of former climatic conditions by using an isotopic O analysis of Cretaceous Belemnite shells (Urey, Science 108, 489(1948)). In this work it was attempted to extend the data so as to comprise, besides crystallizations from surface waters (at about 25°C), those from hydrothermal solutions and from magmatic fluids. The first class (stalactites, lake and marine limestones) showed heavy-oxygen enrichments, with respect to river water, of 6.8 to 8.1 γ; in the second class (calcites and dolomites from hot hydrothermal springs) the variations

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were 2.3 to 3.0 γ; in the third group (two calcites of magmatic origin) the enrichments were 5.6 and 6.0 γ. The disagreement between the latter result and the foregoing temperature-dependence rule points to the special conditions of carbonate formation from the magma.

6395 Isotopic Composition of Oxygen in Organic Substances of Vegetable Origin. R. V. Teĭs. Doklady Akad. Nauk S.S.S.R. 72, 351-3(1950) May 11 (in Russian).

Morita et al. (Bull. Chem. Soc. Japan 13, 99(1938)) have found values varying between 3.6 and 5.6 γ for the heavy-oxygen content in cane sugar. For oxygen in maize glucose and in cotton cellulose the present author found the much higher values γ = 10.0 to 10.8. Since the heavy-isotope content in CO_2 exceeds that of water by 11 γ, the stated finding agrees with the fact (Vinogradov and Teĭs, Doklady Akad. Nauk S.S.S.R. 33, No. 9(1941); 56, No. 1(1947)) that oxygen liberated during the photosynthesis has the isotopic composition of water; it is seen that the assimilated oxygen is taken from CO_2, while the liberated O_2 originates from H_2O.

6396 Recent Development Work on the 9-cm Trochoidal Mass Analyzer. O. C. Yonts and G. K. Werner. Y-591, June 21, 1950. 40p.

Early in the stable isotope program at the Oak Ridge National Laboratory, a need was recognized for a small, simple mass spectrometer for rapid assay work. The most attractive type of instrument for this purpose appeared to be the trochoidal-type mass analyzer which utilizes the perfect focusing properties of crossed electric and magnetic fields. A small crossed-field instrument with the distance between focal points approximately 9 cm was built and put into operation. Construction and design of this instrument and of a revised model of the same general type are reported in this paper. Photographs of the equipment and copies of typical scans are included.

6397 Measurements of the Gaseous Thermal Diffusion Constants for Oxygen ($O^{18}O^{18}$ - $O^{16}O^{16}$) and Methane ($C^{13}H_4$ - $C^{12}H_4$). W. H. Denton. Atomic Energy Research Establishment. AERE-G/R-469, Mar. 1950. 22p.

The thermal diffusion constant, α, has been measured for the two gaseous isotope mixtures, oxygen ($O^{18}O^{18}$ - $O^{16}O^{16}$) and methane ($C^{13}H_4$ - $C^{12}H_4$), using the two-bulb "repeated process" method. The temperature difference, ΔT, ranged from 215 to 630° (T_0 = 290°K) for oxygen. Accuracies of ± 25% and ±10% of α were normally obtained for oxygen and methane, respectively. The accuracy of measurement of α by this method is normally very low for isotope mixtures, because of the very small enrichment produced in a final sample of sufficient mass for the mass spectrometer analysis. The practical limitations to increasing this enrichment, and the dependence of the ultimate accuracy on the isotope mixture itself, are discussed. To make a reasonably accurate measurement of α for most isotope mixtures it is necessary to be able to analyze gas samples of the order of a few micrograms with the mass spectrometer, whereas samples of about 1 mg were required at this time. The most reliable results, for T_0 = 290°K, are as follows: for oxygen, α is between 0.008 ± 0.002 and 0.012 ± 0.002 for ΔT between 200 and 400° and the true values may be up to 35% higher than these since it is uncertain to what extent

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the diffusion effect was eliminated; for methane, $\alpha = 0.012 \pm 0.0012$ for $\Delta T = 415°$; and for neon, $\alpha = 0.024 \pm 0.002$ for $\Delta T = 325°$, where the errors are standard deviations. The corresponding values predicted by the inverse power model, from viscosity data, lie within the standard deviation range of each of the foregoing results. (auth)

6398 The Entrance Slit in a Precision Mass Spectrograph. Heinz Ewald. Z. Naturforsch. 5a, 229(1950) (in German).

A description is given of the ion-entrance slit in the Mattauch-Herzog mass spectrograph constructed in Germany during the war (Ewald, Z. Naturforsch 1, 131(1946)). The slit is formed by two parallel steel cylinders (7.5 cm diameter), whose surfaces are permanently 0.3 mm apart. This is the maximal width of the slit when the ion path is perpendicular to the plane passing through the two cylinder axes. By rotating that plane, the effective slit width is reduced.

6399 Total Charges of Fission Fragments in Gaseous and Solid Media. N. O. Lassen. Phys. Rev. 79, 1016-17 (1950) Sept. 15 (Letter to the editor).

Fission fragments emerging from a uranium layer were allowed to travel through argon or other gases in a deflection chamber. At suitably low gas pressures, equilibrium between capture and loss of electrons was established in the first few millimeters of the 200-mm path, and variations in velocity and mean charge could be neglected. The magnetic deflection of a fragment was proportional to the mean charge of the fragment in the gas. With a vacuum in the chamber, on the other hand, the charges of the fragments in uranium determined their deflection, and, with a thin cover layer of another metal over the uranium in vacuum, the charges in that metal were controlling. Fragments in the heavy group were found to have higher charges in solids and lower charges in gases than did those in the lighter group. The charges in general were much lower in gases than in solids. The mean charge reached equilibrium at ~1 mm Hg in argon and then rose very slowly with increasing pressure.

6400 Graphical Determination of Transmission Curves for Certain Magnetic Lens Beta-ray Spectrometers. J. F. Perkins and A. W. Solbrig, Jr. ORO-2, 1949. 13p.

A graphical method is described for determining the transmission curve of a point source on the axis of a thick magnetic lens beta-ray spectrometer with ring-focusing baffles. The method is applicable to spectrometers in which the magnetic field in the region between the ring-focus position and the detector is weak compared with the maximum field in the instrument. It requires the computation of only a few electron paths because the plot of the radial coordinate against the axial coordinate is very nearly linear beyond the ring-focus position. Transmission curves are drawn for two different baffle systems in a particular instrument, and it is shown that the low-energy side of the curve may be steepened considerably by the use of two outer baffles and a properly located counter aperture. (auth)

6401 A Method for the Study of Decay Schemes of Isotopes Which Decay by Orbital Capture. Henry C. Thomas. ORO-3, 1950. 71p.

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A method is suggested and tried for detecting soft Auger electrons from orbital capture by the use of windowless coincidence counters, enclosed with the source in a chamber containing helium and ethyl alcohol at low pressure. Results with Sn^{113} were inconclusive because of radiations from what were suspected to be impurities. 28 references.

6402 The Use of Three Long Rectangular Coils for Neutralization of the Earth's Magnetic Field in a Lens-type Beta-ray Spectrometer. S. K. Haynes and J. W. Wedding. ORO-4, nd. 16p.

Accurate neutralization of the earth's magnetic field B_e over a long cylindrical region is necessary to extend the energy range of a magnetic-lens spectrometer to electrons of very low energy. Three parallel rectangular coils are used. The center coil has a width 2a, a length 10a and N turns. Each outer coil has a width $\sqrt{2}a$, the same length, and $N/\sqrt{2}$ turns. They are placed at a distance $a/\sqrt{2}$ on each side of the center coil. In a plane transverse to the length of the coils the radial variation of the field is given approximately by the term $B_e(r/a)^8$. This term gives variations of about ±1% separated by 30 deg azimuthally. With the coil current set for zero deflection for axial electrons, the rotation of the nonaxial trajectories averages out these deviations so that the effective residual field is less than 0.1% of the earth's field. For a 1-meter spectrometer, 1-kev electrons are deflected 0.1 mm. The construction of the coils is described. (auth)

6403 Actual Amounts of Stray Radiations in Medical X-ray Installations. R. Lehner. Strahlentherapie 82, 395-400(1950) July 7.

The instrument measuring stray x-radiations in medical institutions in Vienna, Austria, (a condenser ionization chamber), has been submitted to a new test. A comparison is made with similar devices adopted in England and the United States.

6404 Calibration of Proportional Counters by the Excitation of Fluorescence Radiation with Radioactive Sources. G. M. Insch. Phil. Mag. 41, 857-62(1950) Sept.

The calibration of proportional counters by means of a very few suitably chosen radioactive sources which are used to excite the fluorescence radiation of various elements is described. The efficiency of excitation is high and the method is of wide application. The accurate identification of isomeric transitions using proportional tubes is demonstrated. (auth)

6405 Detection of Scintillations from Crystals with a Photo-Sensitive Geiger-Müller Counter. C. E. Mandeville and H. O. Albrecht. Phys. Rev. 79, 1010-11(1950) Sept. 15 (Letter to the editor).

The possibilities and advantages in the use of crystals fluorescing in the deep ultraviolet, when bombarded by nuclear particles, were investigated. When silver-activated NaCl was irradiated with the alpha particles of polonium, the crystals fluoresced vigorously, emitting quanta at wavelengths for the most part less than 2600 A. The quantum radiations were detected with a high efficiency in several different photon counters. The counters were relatively insensitive, and it is certain that the absolute efficiency for alpha particles can be increased to 100%. The activity

of the NaCl-Ag crystals was proportional to the concentration of AgCl in the interval 0.03 to 1.0% by weight. Below this interval the activity decreased rapidly, and above it the crystals lost transmission and became cloudy, perhaps due to the fact that some silver did not remain in solution. The decay constant of NaCl-Ag must be less than 0.2 μsec. Now that it has been demonstrated that G-M counters possess enough quantum efficiency in the deep ultraviolet to use them as scintillation counters, an effort is being made to find crystals which will give copious ultraviolet fluorescence when irradiated by β rays and γ rays.

6406 Double Crystal and Slit Methods in Small Angle X-ray Scattering. H. N. Ritland, P. Kaesberg, and W. W. Beeman. J. Applied Phys. 21, 838-41(1950) Aug.

An angular resolution of about 10 sec of arc may be obtained with a double calcite crystal spectrometer for Cu K_α radiation. However, the shape of the rocking curve at large angles is such as to make the detection of radiation from weakly scattering materials difficult. Of the order of 10^6 cts/sec are detected with a stationary, water-cooled copper target and parallel crystals. Wing intensities, even at large angles, do not fall much below 10^2 cts/sec. Wing heights may be considerably reduced by the addition of a third calcite crystal. With this modification the crystal spectrometer is a useful instrument for most scattering experiments in which extremely high resolution is desired. It is inferior to a slit system and Geiger counter arrangement when poorer resolution may be tolerated but high sensitivity is required. A slit instrument with an angular resolution of 4 or 5 min of arc provides an effective incident flux of more than 10^6 cts/sec while wing intensities may be as low as 1 ct/sec. (auth)

6407 A Double Thin Lens Beta Ray Spectrometer. C. M. Van Atta, Sydney D. Warshaw, Joses J. L. Chen, and Samuel I. Taimuty. Office of Naval Research, University of California. Aug. 1, 1950. 22p. (AEC File No. NP-1724.)

A description of the performance of a double thin magnetic lens beta-ray spectrometer is given. A detailed investigation of the separate distortions introduced by chamber misalignment, internal scattering, charged source, and poor resolution has been made, and the results are presented qualitatively. An alignment procedure is presented, and the arrangement of baffles to minimize scattering is shown. (auth)

6408 Expansion Valve for Triggered Cloud Chambers. Jacob L. Zar. Rev. Sci. Instruments 21, 812(1950) Sept. (Laboratory and shop note.)

The valve shown and described is a modification of the one described by Fussel (Rev. Sci. Inst. 10, 321(1939)) in which an unsupported rubber ring is sealed against a valve disk mounted on a solenoid armature. The magnetic force on the armature in the closed gap position is sufficient to hold the valve closed; but when the exciting current is removed, air pressure against the disk provides the necessary force for rapidly opening the valve. (auth)

6409 Instrumentation for Radioactivity. George F. Pieper. Science 112, 377-81(1950) Oct. 6.

The theory and operation of ionization chambers, proportional counters, Geiger counters, crystal counters, scintillation counters using a crystalline phosphor, photomultiplier tubes, scaling circuits, and integrator circuits are discussed. 13 references.

6410 Investigation of Properties of AgCl Crystal "Ionization Chambers." L. A. Geraseva, I. D. Rapoport, I. S. Shapiro, and I. G. Sheĭnker. Doklady Akad. Nauk S.S.S.R. 72, 261-4(1950) May 11 (in Russian).

A study was made of counters prepared from AgCl monocrystals, with silver-covered end surfaces obtained with the aid of a developer. The crystals, immersed in liquid N, were irradiated with monochromatic γ rays from Co^{60} and with β particles from P^{32}; the pulse intensity was measured by the upper limit of the integral spectrum. A polarization effect, growing with time and impairing the efficiency of the counter, is observed soon after the beginning of work (½ hr); it is due to the appearance of a heterogeneous electric field within the crystal, estimated at 5×10^3 v/cm after 2 hr work with 10^3 ions/min. Depolarization can be obtained (other than by heating the crystal) by applying a field of opposite direction for a few minutes.

6411 A New Method for the Determination of Component Contents in Certain Fine-Grained Minerals. Ivan Th. Rosenqvist. Norsk Geol. Tids. 28, 21-6(1949) (in Norwegian).

In some rock formations, such as clays, the grains are too small to permit a component analysis, by a microscopic identification, through the measurement of optical constants. A method is devised in which the differences in adsorbing powers are used in order to distinguish between various minerals. A suspension of a crushed rock is deposited through a radium-bromide solution onto a photographic plate and the resulting image is examined under a microscope; the relative sizes of total surfaces covered by images of variously darkened grains give the desired relative contents. Five microphotographs are shown.

6412 Note on Reduction of Background Fog in Nuclear Emulsion Plates. P. K. S. Wang. Rev. Sci. Instruments 21, 816-17(1950) Sept. (Laboratory and shop note.)

Some difficulty has been encountered because of electron background in nuclear emulsion plates exposed directly in the x-ray beam of a betatron (Cameron and Millar, Phys. Rev. 78, 337(1950); Wang and Wiener, Phys. Rev. 76, 1724 (1949)). This note describes a refixation technique to reduce the electron background density of emulsions which includes the placing in x-ray fixer at 20°C for times of 1 hr or longer.

6413 The Photographic Emulsion in Nuclear Physics. H. de Vries. Nederland Tijdschr. Natuurk. 16, 127-36(1950) June (in Dutch).

An introductory treatment of the problems of the use of photoemulsions in nuclear physics is presented.

6414 Proportional Counters in a Magnetic Field: An Investigation of the Isomerism of Br^{80} and a Measurement of the Fluorescence Yield of Krypton. D. West and P. Rothwell. Phil. Mag. 41, 873-89(1950) Sept.

The proportional counter technique for measuring the energy of soft electrons has been extended to include higher energy radiations by placing the counter in a strong magnetic field. Suitable x-ray calibration sources consisting of long-lived K-capture bodies which give lines at energies up to 50 kev

have been developed. In an application of the technique to a study of the isomerism of Br^{80}, the conversion coefficient of the 37-kev gamma ray was found to be 1.2, which is close to the calculated value for an electric dipole transition. In a second application, the fluorescence yield of the K shell of krypton was measured. The value obtained was 0.67. 21 references. (auth)

6415 Pulses in Argon Counters. Laura Colli, Ugo Facchini, and Emilio Gatti. Phys. Rev. 80, 92-3(1950) Oct. 1 (Letter to the editor).

Oscilloscope studies were made of α- and β-particle pulses in argon-filled counters operating in the proportional and Geiger zones. The successive pulses in the building-up of the discharge, caused by recurring avalanches of electrons each released from the wall by photons generated near the wire by the preceding avalanche, could be sharply separated by adopting a suitably small time constant. This sharp separation indicated that possible photoionization in the gas did not play an important role, inasmuch as only a single transit time seemed to be involved.

6416 Relativistic Increase in Ionization of Charged Particles in Photographic Emulsions. E. Pickup and L. Voyvodic. Phys. Rev. 80, 89-90(1950) Oct. 1 (Letter to the editor).

The ionization and energies of mesons, electrons, and protons leaving tracks in nuclear plates were measured by grain counting and multiple coulomb scattering, respectively. The results indicate a minimum value of ionization at $E/\mu \sim 3$, followed by an increase of about 10% to a plateau which starts at $E/\mu \sim 20$ and extends to very high values. Good general agreement is had with theory.

6417 Report on Four Miscellaneous Investigations. F. E. Senftle. Department of Mines and Technical Surveys, Mines Branch, Ottawa, June 17, 1950. 14p. (AEC File No. NP-1693.)

I. The first report deals with a specially designed cathode to reduce the gamma efficiency of a Geiger counter. The silver deposit on the cathode is reduced by scratching off in spiral form, at the same time maintaining a sufficiently uniform field.

II. In order to improve the geometry of a Geiger counter a doughnut-shaped tube with four symmetrically placed fine tungsten wires in the active volume was constructed. A large sample could then be placed in the center of the tube. The cathode consisted of an aquadag film on the inside of the outer wall of the glass envelope. The principal disadvantage of this tube is the large decrease in its plateau.

III. A Geiger tube was used as a substitute for a photomultiplier tube in scintillation counting. The Geiger tube was connected in the usual manner except that the high voltage supply was constructed with a very fine voltage control. It was found that by adjusting the voltage so that the operating potential was just below the Geiger threshold, the tube was less sensitive to ordinary gamma quanta than it was to light quanta from the phosphor. To compare the efficiencies of the photo-Geiger and photomultiplier tubes, a photomultiplier tube was mounted at one side of the photo-Geiger tube, looking into the active volume of the tube. For a given source, the number of ultraviolet light flashes produced by the Geiger counter were approximately the same as

the number of pulses recorded by the photomultiplier tube when similar phosphor screens were used.

IV. A photomultiplier tube was used to count the α particles from various amounts of uranium (U_3O_8). A plot of counting rate versus concentration of uranium shows linearity except at very weak concentrations and a practical lower limit of about 0.5 mg of U_3O_8. Experiments were undertaken to insure an even deposit of U_3O_8 for scintillation counting purposes. The following procedure is indicated. Reduce the sample to a small volume in a beaker, transfer to the cylindrical type dish, and evaporate under an infrared lamp. Add 2 to 4 drops of potassium ferrocyanide and dilute slightly with water. An even precipitate is formed after again evaporating to dryness.

6418 The Scintillation Efficiency of Anthracene for Low Energy Electrons. W. J. Ramler and M. S. Freedman. Rev. Sci. Instruments 21, 784-7(1950) Sept.

The efficiency of an anthracene scintillation counter used as the detector in a double magnetic lens β-ray spectrometer for electrons in the range 0 to 20 kev has been determined. Monoenergetic electrons, generated by an electron gun, were focused on the anthracene crystal, the beam being concurrently monitored by an electron collector and electrometer. The results are shown. (auth)

6419 A Self-Triggering Cloud-Chamber Counter. E. L. Fireman and G. M. McHaney. Rev. Sci. Instruments 21, 813-15(1950) Sept. (Laboratory and shop note.)

A self-triggering cloud chamber was made by inserting open counters inside an ordinary cloud chamber. The cloud chamber triggers itself by coincident counter pulses and the corresponding tracks are observed. This type of chamber permits the observation of rare events involving coincidences of soft particles, e.g., pairs of electrons from extremely weak sources. It is about 1200 times more sensitive for coincidence electrons than is the corresponding randomly expanding cloud chamber. A description of the apparatus together with some preliminary results is presented.

6420 A Thick-Walled Ionization Chamber for Measuring the Intensity of Gamma-Radiation of Energy Up to 25 Mev. J. D. Lawson. Atomic Energy Research Establishment. AERE-G/R-555, Aug. 1950. 15p.

Reliable measurements of the gamma radiation from betatrons and synchrotrons are notoriously difficult to make. To specify machine output, both the spectral distribution of energy and the power flux per unit solid angle in the direction of the beam maximum must be known. In this report, the design of a thick-walled ionization chamber suitable for measuring the radiation intensity from synchrotrons and betatrons operating at energies up to 25 Mev is described. Calibration curves, based on calculations of the ionization in aluminum, are given. These enable the number of quanta per unit energy interval to be found in terms of the ionization current in the chamber for any assumed spectrum.

6421 X-ray Dose Determinations with Chloral Hydrate. Howard L. Andrews and Parkhurst A. Short. J. Chem. Phys. 18, 1165-8(1950) Sept.

The chemical effects of x-rays on aqueous solutions of chloral hydrate, $CCl_3CH(OH)_2$, have been studied. The primary reaction is the conversion of the organic halogen to HCl, and the resulting changes in electrical conductance

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have been used for the determination of x-ray dosage. The change in conductance is linear with x-ray dose and independent of dose-rate over a wide range. This compound has been used to determine the total output and depth-dose curves from a high-intensity beryllium-window x-ray tube. (auth)

6422 Charge Distribution in Coarse Aerosols as a Function of Time. W. B. Kunkel. J. Applied Phys. 21, 833-7(1950) Aug.

The interaction of small particles suspended in air with the ions normally produced in the air is discussed. The neutralization of highly charged dust particles, if suspended in air, is treated in detail. The result is found to be in qualitative agreement with experiment. The special case of final equilibrium is investigated. It is found that multiply charged particles should be present in appreciable number in coarse aerosols at all times. This is confirmed by experiments both for initially charged quartz dust and for initially neutral ammonium chloride smoke. The general nature of an equilibrium charge distribution is presented. Charges up to ten electron units are found to be not uncommon. (auth)

6423 Observations on the Radium A Content of the Atmosphere. Thomas Burke, O. Carm, and J. J. Nolan. Proc. Roy. Irish Acad. 53, 145-61(1950) July.

The observations were carried out by drawing the atmospheric air through a cylindrical condenser, the outer cylinder being at a high positive potential and the inner cylinder covered with paper. The positively charged carriers were deposited on the paper, the activity of various sections of which was subsequently tested. The most important element affecting the Ra A content of the lower atmosphere is wind. Under calm conditions high values are found; with increasing air movement the content diminishes. The atmospheric conditions which favor high values of Ra A content favor high values for the concentration of condensation nuclei and conversely. A considerable proportion of the Ra A carriers have mobilities between 0.045 and 0.015 cm/sec/volt/cm, corresponding to those of the intermediate ions. These carriers are always present. With high content of the Ra A and high nucleus content, some of the carriers have mobilities lower than those of the intermediate ions. Because of (a) absence of equilibrium, and (b) the associated variation of the radioactive and the nucleus contents of the air, none of the equations proposed for the relation between nucleus content and conductivity for the lower layers of the atmosphere can be valid.

6424 The Static Electrification of Dust Particles on Dispersion into a Cloud. W. B Kunkel. J. Applied Phys. 21, 820-32(1950) Aug.

An extensive study of the charge and size distribution of particles from 0.5 to 30 μ radius in dust clouds of diverse exemplary types dispersed in air under a variety of conditions ranging from blowing with minimum of turbulence to conditions of violent and maximum impact with various types of surfaces was made using adaptations of the Hopper and Laby modification of the oil drop experiment (Proc. Roy. Soc. (London) A178, 243(1941)). It was observed that all dusts, including homogeneous dusts with no impacts of solid surfaces, were charged. In homogeneous systems the charges of opposite sign were equal, no net charge resulting, the number of particles of similar size with opposite charges being about the same. The magnitude of charges increased somewhat less rapidly than the surface of the particle. There

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was no correlation between size and sign of charge. There is strong evidence that charging occurs on separation of the contacts between particles in the dispersion of the cloud. Humidity did not affect the charging. Studies of heterogeneous systems making contact with solid walls of different composition from the powder gave consistent asymmetry of charge of varying degrees depending on the proportion of particles striking the surfaces relative to those just separated. (auth)

6425 The Microwave Spectrum of BrCl. D. F. Smith, M. Tidwell, and D. V. P. Williams. Phys. Rev. 79, 1007-08(1950) Sept. 15 (Letter to the editor).

By mixing Br_2 and Cl_2, an equilibrium is established between these two halides and BrCl. An unseparated mixture has been employed to observe the transitions corresponding to the $J = 0 \rightarrow 1$ rotational spectrum of BrCl in the region of 9000 Mc/sec. In all, some 29 lines have been observed and their frequencies measured. The ratio $m(Cl^{35})/m(Cl^{37})$ is 0.945987 ± 0.000008 for the $Br^{79}Cl^{35}$, $Br^{79}Cl^{37}$ pair, and 0.945986 ± 0.000008 for the $Br^{81}Cl^{35}$, $Br^{81}Cl^{37}$ pair. The value for $m(Br^{79})/m(Br^{81})$ is 0.975218 ± 0.000028 for the $Br^{79}Cl^{35}/Br^{81}Cl^{35}$ pair and 0.975210 ± 0.000028 for the $Br^{79}Cl^{37}$, $Br^{81}Cl^{37}$ pair.

6426 The Molecular Spectrum of He^3. G. H. Dieke and Eugene Sant Robinson. Phys. Rev. 80, 1-5(1950) Oct. 1.

The band spectrum of the molecule $(He^3)_2$ has been studied in the region from 3000 A to longer wavelengths. The rotational and vibrational molecular constants have been determined for the band system $3p^3\,\Sigma \rightarrow 2s^3\,\Sigma$. A spin of ½ is confirmed for He^3 by the intensity ratio of the alternately weak and strong rotational lines.

6427 Study of High Polymers by Nuclear Magnetism. I. Line Widths at Room Temperature. L. V. Holroyd, B. A. Mrowca, and E. Guth. Phys. Rev. 79, 1026 (1950) Sept. 15 (Letter to the editor).

The magnetic resonance line widths of nine polymers at room temperature, obtained in a field of approximately 7000 gauss at about 30 Mc, are tabulated. The narrowness of the line width for unvulcanized natural rubber and GR-S (~70/30 butadiene styrene co-polymer) shows that the "free" rotation of molecules containing proton groups is about as fast in these rubbery materials as that of the protons in water. It seems that the method of nuclear magnetism is the first one to prove directly the existence of "free" rotation in polymers, a concept which was previously inferred indirectly from other phenomena and which forms the basis of the statistical network theory of rubber elasticity.

6428 Study of High Polymers by Nuclear Magnetism. II. Line Widths through Transition Temperatures. B. A. Mrowca, L. V Holroyd, and E. Guth. Phys. Rev. 79, 1026-7(1950) Sept. 15 (Letter to the editor).

The polymers reported on in the preceding letter (NSA 4-6427) exhibit in a certain temperature region a transition from the soft rubbery state to a hard, glassy state. The magnetic resonance line width was found to increase with decreasing temperature through this transition region. As one lowers the temperature, the first step is a slow increase of the line width; it may be associated with a gradual decrease of the free volume of the molecules which interferes with the relative motion of adjacent chain segments. The second step

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is a more or less sudden increase in line width which suggests a cessation of some type of motion, presumably the rotation of molecular groups. The third step, a further gradual increase of the line width, may be connected with a gradual stopping of the sliding of adjacent segments past each other. Conversely, starting at low temperatures, "holes" must first be created for motion of the segments, before free rotation in the segments can set in. The whole three-step transition must be due to short-range forces involving near neighbors only.

6429 Angular Distribution of Neutrons from the Bombardment of Be by 340-Mev Protons. James DeJuren. AECD-2900, June 26, 1950. Decl. Aug. 17, 1950. 4p.

The angular distribution of neutrons produced by the bombardment of beryllium targets has been measured using bismuth fission chambers as detectors. The data from 15 to 27 deg were taken using the neutrons produced from the bombardment of a 2.8-in. Be target with 330-Mev protons inside the cyclotron. Shallow fission chambers containing two 4.5-in. diameter bismuth-coated plates were employed as monitor and detector. The 8-deg result was obtained from the bombardment of a 2-in. Be target with 350-Mev protons at the standard probe position. The angular range was extended to 85 deg by measurements made with the neutrons produced from a $1^{11}/_{16}$-in. diameter beryllium rod by the electromagnetically deflected, external 345-Mev proton beam.

6430 Neutron Diffraction in Glasses. A. H. Weber. AECU-911, June 29, 1950. 46p.

The use of neutron diffraction data to investigate the structural properties of various glasses, including boron-free plate glass, fuzed quartz, pyrex, and two forms of 100% B_2O_3 glass, is reported. Graphical presentation of data is used as a basis for conclusions regarding structure. 16 references.

6431 Neutron Scattering Cross Sections of the Noble Gases. Sigmund P. Harris. Phys. Rev. 80, 20-2 (1950) Oct. 1.

The neutron scattering cross sections of five noble gases were measured, using a pile neutron beam and an annular BF_3 proportional counter. Boron absorption and self-indication techniques were used to detect resonances. A strong neutron resonance was found in xenon and appears to have a considerable portion of scattering in the energy region of ~11 ev. Indications of resonances in argon and krypton were obtained. (auth)

6432 Neutron Scattering Resonances of Lithium. Robert K. Adair. Phys. Rev 79, 1018-19(1950) Sept. 15 (Letter to the editor).

The total neutron cross section of Li as a function of energy was measured in the range 20 to 1400 kev. The cross section of ~1 barn rises to a peak of ~7.8 at 270 kev. On the assumption that elastic scattering is the only important process, it is shown that the peak should be attributed to the interaction of P-neutrons with Li^7 to form an excited state of Li^8 with spin 2. A slow rise to a cross section of 1.6 barns at 1400 kev is attributed to a resonant reaction of S-neutrons to form a state of spin 2 in Li^8 at a neutron energy of about 1.15 Mev.

6433 Low States of Li^7 in Intermediate Coupling. H. H. Hummel and D. R. Inglis. ANL-4497, nd. 18p.

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The intermediate-coupling transition of the five lowest levels of Li^7-Be^7 is discussed. Some analytical emphasis is placed on the approach from the jj coupling extreme with ordinary (nonexchange) interactions, in which case there is a first-order degeneracy which might have helped explain the scarcity of low levels except that second-order perturbations are shown to be too large. The only possibility of obtaining just two isolated low levels with either ordinary or Majorana interactions lies near the LS coupling extreme, with angular momentum I = ½ for the excited state. It is not clear from conflicting experimental indications whether this value of I is correct. (auth)

6434 Angular Correlation in the Reaction $F^{19}(p,\alpha)O^{16*}$-$(\gamma)O^{16}$. Wayne R. Arnold. Phys. Rev. 80, 34-9(1950) Oct. 1. (See also NSA 4-5480.)

The angular correlation of α particles and γ rays from the 340-kev resonance in the reaction $F^{19}(p,\alpha)O^{16*}(\gamma)O^{16}$ has been observed. This correlation is very strong and allows a unique identification with a correlation calculated for this transition by the method of Hamilton (Phys. Rev. 58, 122(1940)). If we assume even parity and zero spin for the ground state of O^{16}, even parity and spin ½ for the ground state of F^{19}, this experiment allows the following assignments of spin and parity: 13.24-Mev excited state of Ne^{20}, spin 1, even parity; 6.14-Mev excited state of O^{16}, spin 3, odd parity. Since no pairs have been observed from this resonance reaction, we can also assign even parity to the 6.0-Mev pair-producing state of O^{16}. (auth)

6435 Energy Levels of Mn^{56} and V^{52}. A. Ya. Abramov. Doklady Akad. Nauk S.S.S.R. 73, 921-4(1950) Aug. 11 (in Russian).

A study was made of the energy distribution of protons emitted from Mn and V targets, in the reactions $Mn^{55}(d,p)Mn^{56}$ and $V^{51}(d,p)V^{52}$, the deuteron energy being 3.8 ± 0.1 Mev. After traversing a wedge-like filter, the protons traversed a photographic plate, leaving short tracks whose number per unit area decreased across the plate. The track-frequency curve presented steps, corresponding to energy levels, at definite wedge thicknesses. Taking into account the possible presence of processes $C^{12}(d,p)C^{13}$ and $O^{16}(d,p)O^{17}$, the following excitation levels were determined: for Mn^{56} 1.22, 1.77, 2.07, 2.45, and 2.82 Mev; for V^{52} 0.72, 1.31, 1.65, 2.04, 2.37, and 2.75 Mev. The mass differences are: $Mn^{56} - Mn^{55}$ = 1.00111 ± 0.00016 and $V^{52} - V^{51}$ = 1.00076 ± 0.00016 mass units.

6436 A Model Serving for the Interpretation of Special Nucleon Numbers in Nuclear Structures. O. Haxel, J. H. D. Jensen, and H. E. Suess. Z. Physik 128, 295-311(1950)(in German).

A term diagram for a nucleon within the potential field of a nucleus is presented, under the assumption that, owing to a strong interaction between spins and orbits, the terms split into components with parallel and antiparallel positions of spins and orbits. By filling successively with nucleons the quantum states so obtained, a direct explanation is reached of the fact that nuclei with certain numbers of protons or neutrons (the magic numbers) show larger mass defects than their neighbors. The odd neutron or proton in an uncompleted nuclear "shell" is responsible for the spin of the whole nucleus and, roughly, for the nuclear magnetic moment. (auth)

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6437 Note on the Li^7 Quadrupole Moment. R. D. Present. Phys. Rev. 80, 43-7(1950) Oct. 1.

Recent measurements unexpectedly determine the sign of the quadrupole moment of Li^7 as positive, although the magnitude is uncertain. On the quasi-atomic model the ground state is $1s^4 2p^3\ ^2P_{1/2}$ and of symmetry [3] in Wigner's "first approximation." The corresponding quadrupole moment is -6 in units of $(r^2)_{2p}/25$. The explanation of the discrepancy is sought in configuration interaction. A variational calculation of the moment has been made, taking into account the P states of symmetry [3] from the low configurations $1s^4 2p^3 3p$ and $1s^4 2p^4 4f$. The maximum value of the moment is +2.32 in the above units; this value is increased by including other configurations. The admixture of [3] P states from excited configurations has no effect on the magnetic moment nor on the matrix element for Be^7 K-capture into the ground state of Li^7; this is satisfactory since the quasi-atomic model agrees reasonably well with experiment in these instances. When the [3] D states from the above configurations are included in the variational calculation, the maximum is raised to 8.03. The configuration interaction need not be large in this case to produce a positive moment; however, the inclusion of the [3] D states does impair the agreement with the magnetic moment and the K-capture data. Considering the wide margin of uncertainty in the estimated experimental quadrupole moment, it is found that all the data are adequately explained without assuming large spin-orbit interaction or large departures from partition symmetry. (auth)

6438 Nuclear Dipole Oscillations and Resonances for High γ Energies. J. Hans D. Jensen and Peter Jensen. Z. Naturforsch. 5a, 343-4(1950) June (in German). (See also NSA 4-6439.)

Various authors have observed resonance phenomena in reactions (γ,x), where x = p,n,2n or a fission, and the γ energy is about 20 Mev. Goldhaber and Teller (Phys. Rev. 74, 1046 (1948)) have interpreted these resonances as characteristic frequencies of a common movement of all protons relatively to all neutrons within the nucleus; for the quantitative treatment of the problem they used the model of a relative oscillation of a solid proton and a solid neutron spheres (see also Present, Phys. Rev. 77, 355(1950)). The authors prefer the more plausible model of two "liquids" and calculate the foregoing characteristic frequencies without introducing any arbitrary parameters, the "counterforces" being given directly by the empirical formulas for the mass defects. For heavy elements, the calculated frequencies are 25% lower than the experimental.

6439 Nuclear Dipole Vibrations. Helmut Steinwedel, J. Hans D. Jensen, and Peter Jensen. Phys. Rev. 79, 1019(1950) Sept. 15 (Letter to the editor). (See also NSA 4-6438.)

Resonances observed in (γ,x) processes, at γ energies of ~20 Mev, have been interpreted as dipole vibrations caused by collective motion of all protons relative to all neutrons inside the nucleus. Whereas Goldhaber and Teller (Phys. Rev. 74, 1048(1948)) treated the case of periodic displacement of a rigid proton sphere relative to a rigid neutron sphere, the more plausible picture is here discussed of an interpenetrating motion of a proton fluid with density $\rho_p(r,t)$, and neutron fluid with density $\rho_n(r,t)$, under the condition of constant total density $\rho_0 = \rho_p + \rho_n$, and fixed nuclear radius $R = r_0 A^{1/3}$. This model, besides representing a case of a peculiar hydrodynamics, does not require any arbitrary parameters. It is easy to include in the formalism the effects of radiative damping and of damping by dissipation of collective motion into disordered motion (heating by friction) followed by nucleon emission. The integrated total cross section is one-half of the corresponding value given by Goldhaber and Teller for the rigid sphere model.

6440 Nuclear Isomerism and Shell Structure. R. D. Hill. Phys. Rev. 79, 1021-2(1950) Sept. 15 (Letter to the editor).

Even Z-odd N isomers, near the closing of the fifth nuclear shell at N or Z = 82, are plotted by energy level differences versus neutron number. Various trends are pointed out. Similar plots of the even-odd and odd-even isomers of the fourth shell, based on present incomplete data, are in agreement with the central elevation theory of nuclear potential wells.

6441 The Nuclear Magnetic Moment of Scandium 45. Norman F. Ramsey. Phys. Rev. 79, 1010(1950) Sept. 15 (Letter to the editor).

It is pointed out that the diamagnetic correction, according to Lamb's formula, is 0.151% in the case of the magnetic moment of Sc^{45}. When applied to the experimental results of Sheriff and Williams (Phys. Rev. 79, 175(1950); NSA 4-5297), this leads to $\mu(Sc^{45}) = 4.7564 \pm 0.0010$ nuclear magnetons.

6442 On the Hyperfine Structure of Hydrogen and Deuterium. A. G. Prodell and P. Kusch. Phys. Rev. 79, 1009-10(1950) Sept. 15 (Letter to the editor).

A new determination of the hyperfine structure separation of both hydrogen and deuterium in the $^2S_{1/2}$ state has been made by the atomic beam method. In the case of hydrogen, measurements of the σ-line and two π-lines gave the separation value $\nu_H = 1420.4051 \pm 0.0003 \times 10^{-6}\ sec^{-1}$. In the case of deuterium, measurements of the two π-lines lead to $\nu_D = 327.38424 \pm 0.00014 \times 10^{-6}\ sec^{-1}$, and thus to the experimental ratio $\nu_H/\nu_D = 4.3386484 \pm 0.0000020$.

6443 On the Spins of Li^6 and B^{10}. G. Racah and N. Zeldes. Phys. Rev. 79, 1012-13(1950) Sept. 15 (Letter to the editor).

According to the p^n shell model, the spins of Li^6 and B^{10} are one in LS coupling, but three in jj coupling. It has, however, been suggested by Inglis, Mayer, and Kurath (Phys. Rev. 77, 724(1950)) that the coupling should be extreme jj and the mixture of exchange forces should be such as to give the correct spins for Li^6 and B^{10}. Some consequences of this hypothesis are discussed. It is concluded that only an interaction of finite range, with a strong Majorana component opposed by an equally strong Bartlett component, and also accompanied by a stronger Heisenberg component, can explain the spins of Li^6 and B^{10} in extreme jj coupling. It is rather doubtful whether such an interaction corresponds to reality.

6444 The Problem of the Neutron-Proton Ratio in Atom Nuclei. Vikt. I. Spitsyn. Doklady Akad. Nauk S.S.S.R. 72, 41-4(1950) May 1 (in Russian).

A relationship is found between the neutron-proton ratio in the predominant isotope of an element and the degree of abundance of that element in the earth's crust. By using this relationship, it is shown that Fr^{217}, At^{211}, Np^{237}, and Pu^{239}

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should be expected to be the most stable isotopes of the corresponding elements.

6445 Proton Density Variation in Nuclei. Helmut Steinwedel and Michael Danos. Phys. Rev. 79, 1019-20 (1950) Sept. 15 (Letter to the editor).

As a companion piece to the letter abstracted as NSA 4-6439, a derivation is given of an expression for the proton density ρ_p. The assumption is made that the "symmetry-energy" term in the nuclear binding energy per nucleon, $K\cdot(Z-N)^2/A^2$ with $K \simeq 20$ Mev, results from an energy density $\epsilon(\rho_p - \rho_n) = K(2\rho_p - \rho_0)^2/\rho_0$ where the nuclear density $\rho_0 = \rho_p + \rho_n$. The derived expression is $\rho_p = \text{const.} \times [1 + \frac{1}{8}(r/\Lambda)^2]$ where $\Lambda^2 = 8K/4\pi e^2\rho_0$.

6446 The Emission of Short Range Alpha Particles from Light Elements under Proton Bombardment. III. The Reactions $Li^6(p,\alpha)He^3$ and $Li^7(p,\gamma)Be^8$. W. E. Burcham and Joan M. Freeman. Phil. Mag. 41, 921-36(1950) Sept. (See also NSA 3-1416 and 4-3524.)

The emission of short range alpha particles associated with the 14.8-Mev gamma radiation produced in the $Li^7(p,\gamma)$ reaction has been established. The energy distribution of these particles can be attributed to a level in the Be^8 nucleus at 3030 ± 100 kev energy, with a width of 2000 kev. Some observations on the energy release (3.97 ± 0.03 Mev), cross section and excitation function for the $Li^6(p,\alpha)He^3$ reaction are also presented. (auth)

6447 The Energy Release in the Reaction $Li^7(d,p)Li^8$. E. B. Paul. Phil. Mag. 41, 942-7(1950) Sept.

In the reaction $Li^7(d,p)Li^8$ the velocity of the center of mass exceeds the velocity of the recoil nucleus in the center of mass system and recoils are observed only at angles less than a certain angle with the deuteron beam. This maximum angle has been observed for several deuteron energies and the Q-value for the reaction determined to be 0.187 ± 0.010 Mev. (auth)

6448 Neutron Capture γ Rays from Cd, Cl, and C. Richard Wilson. Phys. Rev. 80, 90-1(1950) Oct. 1 (Letter to the editor).

Specimens of Cd and of CCl_4 were placed in a beam of thermal neutrons from the graphite pile, BEPO. The capture γ rays were measured by measuring the pulse-height distribution of photoprotons, from disintegration of deuterium, in an ionization chamber counter placed behind the specimen. Spectra of γ-ray intensity versus γ-ray energy are shown for Cd, CCl_4, and C. The cadmium spectrum has the shape one would expect from the statistics of a many-level nucleus. Even here, however, there are distinct signs of a peaked distribution, probably caused by a grouping of levels rather than by single γ-ray transitions. The chlorine spectrum shows definite signs of level structure. Five γ-ray peaks were found in carbon at 3.05, 3.4, 3.65, 4.1, and 4.95 ± 0.05 Mev. The last appears to be a transition direct to the ground state of C^{13}. The 4.1-Mev γ ray is probably a transition to the 0.8-Mev metastable state of C^{13}, and the 3.05-Mev γ ray may be a transition from the 3.1-Mev excited level to the ground state. The 3.4- and 3.6-Mev γ rays may come from levels not previously reported, or from impurity capture.

6449 Search for the Negative Proton in Fission. J. M. C. Scott and E. W. Titterton. Atomic Energy Research Establishment. AERE-G/M-51, May 1950. 4p.; Phil. Mag. 41, 918-20(1950) Sept.

The possibility of negative proton emission in fission, as an alternative to β^- and delayed neutron emission, is discussed theoretically, and an anology is made with positrons by applying Dirac's equation of the electron to the proton (even though the Dirac equation does not give the proper magnetic moment for the proton). The probability of finding tracks associated with negative protons in emulsions impregnated with uranium and bombarded with slow neutrons is estimated. A search for negative protons in these emulsions led to the conclusion that negative proton emission in fission is an extremely improbable process. Accepting 0.8% (Hughes et al., Phys. Rev. 73, 111(1948)) as the yield of delayed neutron emitters in the slow neutron fission of U^{235} the experiment allows an upper limit of 1 in 5×10^3 to the probability of negative proton emission relative to delayed neutron emission from these fragments.

6450 The Cyclotron and Proton Synchrotron at the University of Birmingham. M. E. Bell and G. F. Hull, Jr. Office of Naval Research, London. Technical Report OANAR-27-50, Mar. 17, 1950. 10p. (See also NSA 4-6216.)

At the present time a cyclotron is being completed at the University of Birmingham, England, to deliver 25-Mev deuterons. The design and construction details are described and some of the difficulties which have been encountered in putting this cyclotron into operation are discussed. A 1.3-Bev proton-synchrotron is in the process of construction and can be said to be roughly half finished. The recent progress made in developing this machine is reported, and the plans for overcoming the radio-frequency tracking problem and the injection problem are discussed in some detail. (auth)

6451 Magnetic Measurements of the Harwell 110-in. Synchrocyclotron. J. B. Adams, T. C. Randle, and A. O. Edmunds. Atomic Energy Research Establishment. AERE-G/R-553, June 1950. 26p.

The ions in a synchrocyclotron travel great distances during their acceleration, constrained vertically in the magnet gap by the focusing forces derived from the curvature of the magnetic lines of force. In the Harwell synchrocyclotron the distance traveled by a proton is about 300 miles in reaching an energy of 175 Mev, and the total vertical height available varies from 4 in. at the center to 3 in. at the periphery of the magnet gap, both dimensions being determined by the dee. Detailed magnetic measurements are necessary to ensure that the ions leaving the source at the center of the cyclotron do not trespass outside these limits and become lost through scattering or absorption in the dee. In this report the methods used to determine the absolute strength and shape of the magnetic field in the gap of the Harwell synchrocyclotron and the apparatus used for the measurements are described in detail.

6452 Loss of Energy of Fast Protons in Matter with Particular Reference to Their Range in Carbon. A. E. Taylor. Phil. Mag. 41, 966-8(1950) Sept. (Letter to the editor).

In using the 110-in. cyclotron at Harwell for measurements of total scattering cross sections and neutron energy spectra (Taylor, Pickavance, Cassels, and Randle, 1950) carbon absorbers of varying thickness have been used in a triple coin-

cidence telescope detecting protons scattered from a polythene radiator. The range in carbon was used to deduce the energy of the protons, since carbon was a convenient material having a low atomic number. This choice was made in order to minimize multiple coulomb scattering and nuclear absorption for efficient operation of the detecting telescope. The range energy relation in carbon for protons up to 200 Mev has been computed in this paper.

6453 Measuring Solid Samples of Low-Energy Beta Emitters. George K. Schweitzer and Bernard R. Stein. Nucleonics 7, No. 3, 65-72(1950) Sept.

Procedures to eliminate or correct for the self-absorption loss of activity incurred in using low-energy beta emitters are outlined. Analytical relations representing this absorption are derived and a comparison is made with a graphical and an experimental method. Methods for preparing samples are described. 30 references.

6454 Scattering of Electrons in Crystals in the Presence of Large Electric Fields. J. Bardeen and W. Shockley. Phys. Rev. 80, 69-71(1950) Oct. 1.

By the calculation of transitions between states appropriate to electrons moving in a large uniform electric field superimposed on a periodic crystal field, it is shown that the probabilities of scattering by lattice vibrations or imperfections are independent of the uniform field and are given by the usual expressions derived for zero field. This justifies the procedure of treating acceleration by the field and scattering as independent processes.

6455 Scattering of Protons by Carbon. W. D. Whitehead. Phys. Rev. 79, 1022-3(1950) Sept. 15 (Letter to the editor).

The angular dependence of the ratio of the elastic proton scattering cross section for carbon to the classical scattering cross section has been determined at 2.0, 2.25, 2.50, and 2.75 Mev. The protons scattered from a thin carbon target on a silver leaf backing were counted with a proportional counter biased to count only those protons near the end of their range. The corrected ratio of the number scattered by carbon to the number scattered by silver determined the ratio of the cross sections. Curves of the ratio versus angle, except the one at 2.0 Mev, all show a definite tendency to decrease at the larger angles, and this probably means that the P wave is there becoming effective. More precise curves are necessary if the P-wave and S-wave components are to be determined accurately.

6456 Fluorescence and Conductivity Phenomena. Progress Report I. Hartmut Kallmann. New York University. April 1950. 75p. (AEC File No. NP-1709.)

It has been shown experimentally in work on fluorescence of solutions, that a number of solvents when excited by high energy radiation exhibit only a very weak light output, but that this light output can be greatly increased by a factor of as much as 35 by the addition of small amounts of fluorescent molecules to the solution. The energy directly absorbed in these dissolved molecules themselves is much too small to be responsible for the high light output of the solutions. This increase in light output is explained by energy transfer from the solvent to the dissolved molecule, by the trapping of the excitation energy in the fluorescent molecule, and then by emission of this excitation energy in form of light from the

fluorescent molecule. These processes of energy transfer trapping the excitation energy and of light emission compete with three other processes: (a) internal quenching of the excitation energy of the solvent molecule in the solvent itself (this competes with the transfer of the excitation energy to the fluorescent molecule); (b) internal quenching in the fluorescent molecule which is independent of the concentration of the fluorescent molecule (this internal quenching seems to be responsible for the different efficiencies of different molecules); and (c) self-quenching among similar fluorescent molecules. The self-quenching process increases with the concentration of the fluorescent molecule and is responsible for the maximum which one observes in all observed light curves in which concentration is a factor. The last two processes compete with the process of light emission in the fluorescent molecules. A general survey of other investigations performed concerns the following: a new detecting device for weak high energy radiation comprising an anthracene crystal, 5819 photomultiplier, and cathode follower tube, an energy discriminating integrating intensity meter, the light emission of different fluorescent material as a function of time, and electric current induced by alpha particles in different materials. (auth)

6457 The Disintegration of Rb^{88}. M. E. Bunker, L. M. Langer, and R. J. D. Moffat. AECU-934, nd. 12p.

The radioactive disintegration of Rb^{88} (17.8 min) has been investigated in a magnetic lens spectrometer. Three β-ray groups are observed having maximum energies of 5.13 ± 0.03, 3.29 ± 0.10, and 2.04 ± 0.15 Mev with intensities of 66, 19, and 15%, respectively. The 5.13-Mev group has a forbidden shape indicating a spin change of 2 units and a parity change. Three γ rays are found with energies of 0.90, 1.86, and 2.8 Mev. A unique decay scheme is presented giving levels in Sr^{88} at 1.86 and 2.8 Mev. These levels are substantiated by a previous investigation of the disintegration of Y^{88} to Sr^{88}. Spins and parities of Rb^{88}, Sr^{88}, and Y^{88} are discussed in the light of the one particle shell model. (auth)

6458 The Beta Disintegration of Th^{233}. M. E. Bunker, L. M. Langer, and R. J. D. Moffat. AECU-935, nd. 5p.

Sources of Th^{233} were prepared by irradiating ThO_2 in the thermal column of a nuclear reactor. A half-life of 23.3 min was obtained by direct measurement over 8 half-lives and was confirmed by studies of the radiation in a magnetic lens spectrometer. The beta spectrum and Fermi plot show that only one group of beta rays exists. The extrapolated energy is 1.23 ± 0.01 Mev. The transition appears to be of the once-forbidden type with a spin change of 0 or 1. A downward deviation of the Fermi plot at low energy cannot be ascribed to source thickness or to counter-window cutoff and is not fully understood. A search for gamma rays was made, and a very weak secondary-electron distribution was observed which was interpreted as resulting from Bremsstrahlung. It is concluded that the beta transition is directly to the ground state of Pa^{233}.

6459 Conversion in Sub-Levels of the L-shell. V. S. Shpinel and N. V. Forafontov. Doklady Akad. Nauk S.S.S.R. 72, 49-52(1950) May 1 (in Russian).

Relative coefficients of conversion, in sublevels of the L-shell, for the 238-kev γ transition in ThC (Bi^{212}) were measured with the aid of counters with 0.86 mg/cm^2 window

thickness. The results, corrected for the absorption in the window, are compared with those of Flammersfeld (Z. Physik 114, 227(1939)) who used much thinner windows:

	K	L_I	L_{II}	L_{III}	M	N
The authors	100	15	0.75	0.15	3.2	0.9
Flammersfeld	100		18		5.6	

6460 Decay of Hg^{197}. H. Frauenfelder, O. Huber, A. de-Shalit, and W. Zünti. Phys. Rev. 79, 1029-30(1950) Sept. 15 (Letter to the editor).

The conversion electrons of Hg^{197} were measured with a magnetic lens spectrometer. K-L and K-M differences led to the conclusion that the converted 133- and 164-kev γ rays belong to Hg^{197}. These are in cascade from the 297-kev 23-hr isomer to the 65-hr ground state. Both the isomer and ground state decay to Au^{197} by K-capture, the former to a 273-kev 7.4-sec isomeric level and the latter to a 77-kev level. Conversion coefficients were determined for the various transitions.

6461 Dosimetry of Thin Polonium Sources. Harold H. Rossi and R. Hobart Ellis, Jr. Nucleonics 7, No. 3, 21-31(1950) Sept.

The flux of α particles above a thin plane source (back-scattering and straggling are neglected) is calculated under the assumption of negligible scattering. The method for calculating the ionization (numerical integration) is indicated and the effect of absorbers discussed. A number of factors in dose measurement are treated, namely, sources, ion chambers, aluminum foils, ionization measurements, and effect of straggling.

6462 Electron Capture/Beta-Decay Ratio in K^{40}. T. Gráf. Phys. Rev. 79, 1014(1950) Sept. 15 (Letter to the editor).

A new determination of the upper limit in K^{40} of the branching ratio, K + L electron capture to beta emission, gave a value of 0.67 ± 0.20. A layer of KF was used as an internal source in a G-M counter, the x-rays accompanying the electron capture being measured by a method of selective detection.

6463 Gamma-Rays of Ag^{105} and Ag^{106}. J. Y. Mei, C. M. Huddleston, and Allan C. G. Mitchell. Phys. Rev. 79, 1010(1950) Sept. 15 (Letter to the editor).

New determinations of γ energies in silver showed 8-day activities of 0.515, 0.722, 1.04, and 1.54 Mev attributed to Ag^{106}, and 45-day activities of 0.064, 0.220, 0.278, 0.340, and 0.437 Mev attributed to Ag^{105}. A Fermi plot of data from the β spectrum of Ag^{111} showed an end point at 1.06 Mev.

6464 Gamma-Spectrum of Ta^{182}. F. E. O'Meara. Phys. Rev. 79, 1032(1950) Sept. 15 (Letter to the editor).

The γ spectrum of 6 months-old Ta^{182} was examined in a thin lens β-spectrometer with uranium as a radiator. The energy and identification of 27 electron lines are tabulated, along with 24 γ-ray energies (0.224 to 1.231 Mev) deduced therefrom.

6465 The Half-Life of $Iodine^{131}$ and the Anomalous Decay of Exposed Sodium Iodide Sources. W. K. Sinclair and E. W. Emery. Brit. J. Radiology 23, 576-8(1950) Sept.

Evaporated samples of sodium iodide containing I^{131} have been observed to decay more rapidly than would be expected from the accepted half-life of 8.0 days. For the investigation of this anomaly a more accurate value of the half-life than the 8.0 ± 0.2 days reported in the literature is required. The half-life has, therefore, been redetermined by counting a sealed sample of I^{131}, a KI^{131} solution, and a carrier-free NaI^{131} solution to give a value of 8.02 ± 0.03 days. Experiments with exposed sources show that iodine escapes from NaI, but it is not clear in exactly what form the escape takes place. No iodine loss was observed from $AgNO_3$-precipitated iodide sources.

6466 Physical Chemistry Research at the University of Vienna. George J. Szasz. Office of Naval Research, London. ONRL-42-50, Apr. 5, 1950. 8p.

In the field of radiochemistry, the dependence of the yields obtained in the Szilard-Chalmers reaction on the energy distribution of the irradiating neutrons in the conversion of MnO_4^- to MnO_2 is being investigated, and the upper limits of possible α activity are being examined with photographic emulsions in which the full length of the α-ray tracks can be measured. The elements so far studied and the half-lives in years of their α activities are as follows: Ag, Br > 10^{18}, Mo > 9×10^{15}, Rb > 17×10^{15}, Zr > 2×10^{15}, Cd > 6×10^{15}, Pb > 3×10^{15}, Bi > 3×10^{15}. Neodymium, praseodymium, and samarium have half-lives of about 2.6×10^{14}, 1.3×10^{14}, and 1.2×10^{14}, if they are α active at all. Other current researches reported are the thermodynamics of binary mixtures, the critical point between the liquid and solid states, high-polymer research, and the polymerization of styrene in a magnetic field.

6467 Radioactivity of Ni^{59} and Ni^{63}. H. W. Wilson. Phys. Rev. 79, 1032-3(1950) Sept. 15 (Letter to the editor).

Neutron-irradiated nickel was found to emit K_α x-rays of Co, in small amount, indicating decay of Ni^{59} by K-capture. If the cross section of Ni^{58}, from which Ni^{59} is formed by slow neutron capture, is taken as 1 barn, the half-life of Ni^{59} is calculated to be 1.8×10^5 years. The main uncertainty is in the cross sectional value. Ross and Story (Reports on Progress in Physics 12, 296(1948-49)) state that the absorption cross section for Ni is between 4.2 and 4.6 barns for thermal neutrons and is mainly due to Ni^{58}. If this is so, the half-life of Ni^{59} is $\sim 8 \times 10^5$ years. On the basis of a cross section of 0.51 barn for Ni^{62}, a half-life of 2.1 years is obtained for Ni^{63}.

6468 Short Range Alpha Particles from the Break-Up of Li^8. A. S. Baxter, W. E. Burcham, and E. B. Paul. Phil. Mag. 41, 937-41(1950) Sept.

The energy spectrum of the alpha particles from the Li^8-Be^8 break-up has been studied using a magnetic analyzer and thin targets. The most probable energy of the alpha particle pair emitted was found to be 3150 ± 50 kev. 12 references. (auth)

6469 The Hamiltonian of the General Theory of Relativity with Electromagnetic Field. Peter G. Bergmann, Robert Penfield, Ralph Schiller, and Henry Zatzkis. Phys. Rev. 80, 81-8(1950) Oct. 1.

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As a specific example of a Hamiltonian of a nonlinear field theory, a Hamiltonian density completely free of time derivatives is given. In accordance with the general theory developed previously, this Hamiltonian is one of the constraints between the canonical variables and, therefore, vanishes everywhere. To obtain this function, methods are developed that will also permit the construction of Hamiltonian densities in any field theory in which the Lagrangian density is quadratic in the first derivatives. In the present formalism, the canonical equations contain no time derivatives on the right-hand sides, but the adoption of a particular Hamiltonian is equivalent to the adoption of a particular coordinate condition and gauge condition. However, once any one Hamiltonian density is obtained, any other one can be readily obtained, thus going over to arbitrary coordinate and gauge conditions by combination with the other constraints of the theory in question.

6470 On the Nature of the 0-0 Nuclear Transitions. I. S. Shapiro. Doklady Akad. Nauk S.S.S.R. 72, 1045-8 (1950) June 21.

Oppenheimer (Phys. Rev. 60, 164(1941)) and Sakharov (Thesis, Phys. Institute of Akad. of Sciences U.S.S.R., 1947 (in Russian)) assumed that the perturbation causing 0-0 nuclear transitions is a coulomb interaction between charged nucleons and electrons. The present author attempts a different interpretation by assuming a virtual liberation of a meson followed by the latter's decay. This leads to formulas that, in general, differ from those given by previous writers. A comparison is made with experimental results of Devons et al. (Nature 164, 539(1949)) on the angular distribution of pairs emitted by excited O^{16} nuclei; it is seen that in this case the 0-0 transition must involve a virtual emission and decay of a pseudoscalar meson standing in a pseudoscalar connection with light particles. It follows that wave functions of the excited and the ground states of O^{16} have different parities.

6471 On the Scattering of π Mesons by Nucleons. J. Ashkin, A. Simon, and R. Marshak. University of Rochester, nd. 52p. (AEC File No. NP-1728.)

The low cross section observed for the scattering of μ mesons by nucleons was long a puzzle and was finally resolved after it was demonstrated that μ mesons are very weakly coupled to nucleons. The strong interaction of π mesons with nucleons, implied by their direct production in nucleon-nucleon collisions, raises the old question in a new form: should π mesons suffer appreciable noncoulombic scattering by nucleons? The present paper attempts to answer this question on the assumption that both the neutral and charged π mesons possess spin zero. The investigation is confined to spin-zero charged π's because, at least for the scalar field with scalar coupling and the pseudoscalar field with pseudoscalar coupling, the higher-order corrections to the scattering cross sections can be obtained by the usual methods of charge and mass renormalization. This is not true for spin-one charged meson fields. Some interest attaches to a comparison with experiment of those predictions of weak-coupling meson theories for which the higher-order corrections can be calculated. The lowest order expressions (valid for all meson energies) for the differential and total scattering cross sections predicted by the scalar and pseudoscalar weak coupling theories are derived. Charge-exchange scattering as well as direct scattering is considered. For the sake of completeness and also because they are so qualitatively different, the cross sections are also recorded in lowest order for the derivative couplings, although the latter can not be handled by the customary renormalization procedures (i.e., scalar theory with vector coupling, pseudoscalar theory with pseudovector coupling). Some representative numerical results are tabulated for both the total cross sections and the angular distributions. The work is reported in considerable detail in the interest of clarity and as an illustration of the power of the new perturbation techniques. The higher-order corrections to the direct and charge-exchange scattering are calculated for the nonderivative couplings for spin-zero mesons using Feynman's method; the results are also checked with Dyson's method. The general formulas are applied to obtain numerical answers in the nonrelativistic (Thomson) limit. The theoretical predictions are compared with existing experimental results. (auth)

6472 Use of Radiotracers to Measure Surface Adsorption from Mixtures. C. M. Judson, Ann A. Argyle, D. J. Salley, and J. K. Dixon. J. Chem. Phys. 18, 1302 (1950) Sept. (Letter to the editor).

A method of using a radiotracer to measure the adsorption of a soluble surface-active agent at the solution-air interface has been developed. The method depends on the fact that the radiation counted at the surface of a solution containing a soft beta-ray emitter is principally radiation from atoms which are near the surface of the solution. Experiments are reported on mixtures of di-n-octyl sodium sulfosuccinate (Aerosol OTN) and di-(2-ethyl hexyl) sodium sulfosuccinate (Aerosol OT), both labeled with S^{35}, which show how the tracer method can be used to measure the surface adsorption of one or more species in a mixture of surface-active agents.

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6473 Dehydration of Alkali-Metal Acid Fluorides. R. C. McHarness and A. F. Benning (to U. S. Atomic Energy Commission). U. S. Patent 2,527,320, Oct. 24, 1950.

By the method of this patent, water may be removed from an alkali metal fluoride by providing an HF content in the alkali metal fluoride and distilling off a portion of the HF, thereby carrying off the water.

6474 Extraction Process for Cerium. James C. Warf (to U. S. Atomic Energy Commission). U. S. Patent 2,523,892, Sept. 26, 1950.

In accordance with the invention disclosed in this patent, cerium may be separated from the other rare earth elements and other material associated therewith by extracting it in its tetravalent form from a salted acid solution by means of nitromethane.

6475 Method of Purifying Inert Gases. Amos S. Newton (to U. S. Atomic Energy Commission). U. S. Patent 2,521,937, Sept. 12, 1950.

This patent discloses a method for purifying an inert gas by passing the gas over metallic uranium at controlled temperatures. Hydrogen-nonmetal compounds may be removed by heating the inert gas with uranium at a temperature sufficiently high to form a compound of uranium and the non-

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metal and further heating the gas with uranium at a lower temperature to form uranium hydride.

6476 Production of Uranium Triiodide. J. A. Holmes (to U. S. Atomic Energy Commission). U. S. Patent 2,524,384, Oct. 3, 1950.

A process for producing uranium triiodide is disclosed. By reacting uranium metal and iodine vapor at an elevated temperature to form UI_4 and then passing the UI_4 through a lower temperature region while maintaining this region at a relatively low partial pressure of iodine, a simultaneous condensation and shift in equilibrium is effected and, UI_3 is produced.

6477 Processes for Production of Mesitylene. W. M. Ewalt (to U. S. Atomic Energy Commission). U. S. Patent 2,526,213, Oct. 17, 1950.

A process is described for producing mesitylene by mixing together the full theoretical quantities of toluene and anhydrous methanol, cooling slightly, adding the cooled mixture to Friedel-Crafts catalyst, heating, and separating the mesitylene so formed.

6478 Fluid Selecting Apparatus. Alfred O. C. Nier, R. B. Thorness, and G. H. Goertzel (to U. S. Atomic Energy Commission). U. S. Patent 2,526,825, Oct. 24, 1950.

This patent describes an apparatus which may be operated to provide a selecting means whereby any one of a number of lines or gas sources may be connected to a previously selected passage.

6479 Pump. H. A. Boorse and Gilbert F. Boeker (to U. S. Atomic Energy Commission). U. S. Patent 2,528,415, Oct. 31, 1950.

This patent relates to an electromagnetic pump particularly adapted for pumping corrosive, poisonous, or noxious fluids, which is characterized by electromagnet means situated exterior of a cylinder, capable of simultaneously rotating and reciprocating a piston within the cylinder.

6480 Stuffing Box and Expansion Joint. M. E. Johnson (to U. S. Atomic Energy Commission). U. S. Patent 2,528,436, Oct. 31, 1950.

This patent discloses a stuffing box and expansion joint assembly for a retort containing a rotating shaft arranged so as to permit longitudinal expansion and misalignment of the retort without interfering with the rotation of the shaft or disturbing the gas-tightness of the stuffing box.

6481 Thermal Flowmeters. J. W. Beams, L. B. Snoddy, and L. G. Hoxton (to U. S. Atomic Energy Commission). U. S. Patent 2,525,197, Oct. 10, 1950.

This patent relates to a thermal flowmeter which will measure accurately the mass rate of flow of gases at low pressures and at low rates of flow.

6482 Valve. J. W. Beams (to U. S. Atomic Energy Commission). U. S. Patent 2,521,891, Sept. 12, 1950.

This patent relates to a valve for a high speed centrifuge or other rotating device which may be opened or closed without regard to the speed of rotation of the device with which it is associated. The valve seat and valve plug are arranged coaxially to, and rotate with, the centrifuge.

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6483 Coating Process. H. I. Schlesinger and G. W. Schaeffer (to U. S. Atomic Energy Commission). U. S. Patent 2,528,454, Oct. 31, 1950.

A method is described for depositing boron in the amorphous state and as a compact, essentially nonporous deposit by heating a metal or other base in an atmosphere of a gaseous boron hydride at a temperature range of from 300 to 500°C.

6484 Method of Forming Uranium Carbon Alloys. J. H. Carter and A. H. Daane (to U. S. Atomic Energy Commission). U. S. Patent 2,526,805, Oct. 24, 1950.

This invention relates to a method for forming uranium-carbon alloys by heating uranium powder and carbon powder in contact with each other at a temperature in excess of the melting point of uranium.

6485 Gamma and X-ray Dosimetric Method. George V. Taplin and Clayton H. Douglas (to U. S. Atomic Energy Commission). U. S. Patent Application No. 158,282.

This patent application concerns a highly stable two-phase liquid system for use in a colorimetric dosimeter for measuring X-ray and gamma radiation.

6486 Low Inductance Resistors. R. J. S. Brown (to U. S. Atomic Energy Commission). U. S. Patent 2,521,894, Sept. 12, 1950.

This invention concerns a low resistance, low inductance resistor comprising essentially a single sheet of resistive material having dielectric material between the folds and conductors connected to its ends. The geometric configuration thus formed causes the magnetic field set up by current passing through one portion of the resistor to be in opposition to the field created by the adjacent portion, thereby resulting in negligible inductance.

6487 Method and Apparatus for Measuring Radiation Quantities. N. O. Roberts (to U. S. Atomic Energy Commission). U. S. Patent Application 157,069.

This patent application describes a compact dosimeter for measuring X-ray and gamma radiation by the use of solutions which undergo a visible color change upon exposure to a predetermined quantity of radiation.

6488 Neutron Velocity Selector. E. Fermi (to U. S. Atomic Energy Commission). U. S. Patent 2,524,379, Oct. 3, 1950.

A neutron velocity selector apparatus is disclosed which utilizes a novel improved rotating shutter and which employs an electronic, photoelectrically controlled means for effecting the activation and deactivation of the associated neutron detection and measuring means following the opening and closing of the shutter.

6489 Portable Radiation Survey Instrument. H. V. Herndon and Rodney G. Hoff (to U. S. Atomic Energy Commission). U. S. Patent Application 184,304.

This patent application discloses an improved circuit which reduces the response time of a radiation measuring device utilizing an ionization chamber.

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6490 Resistance Capacitance Network. W. R. Baker (to U. S. Atomic Energy Commission). U. S. Patent 2,523,856, Sept. 26, 1950.

This patent covers a variable noninductive R. C. filter having resistance and capacitance merged into a single unit with the capacitance distributed evenly along the resistance so as to permit convenient phase shifting for frequency control in an R. C. oscillator.

6491 Saturable Core Triggered Gap. Q. A. Kerns (to U. S. Atomic Energy Commission). U. S. Patent 2,524,388, Oct. 3, 1950.

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This patent covers an arc gap unit capable of passing a heavy current substantially instantaneously and containing a saturable core as an integral part of the unit.

6492 Scaling Circuit. W. H. Bradley (to U. S. Atomic Energy Commission). U. S. Patent 2,524,692, Oct. 3, 1950.

This patent describes a scaling circuit having a scaling stage which will operate on input pulses of positive polarity. Another feature of this circuit is the provision of a pulse-height selector direct-coupled to the first scaling stage, without the use of a circuit having a time constant.

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